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MEMORANDUM:

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Subject: Amendment to the the Disulfoton Occupational and Residential Exposure and Risk Assessment (DP Barcode D268430)

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cc: David Anderson, Christina Jarvis

This memo documents addresses questions that you have raised concerning the original Occupational and Residential Exposure and Risk Assessment for Disulfoton and presents revised assessments for several exposure scenarios for your inclusion in the Disulfoton iRED.

Occupational Issues

- ***Refine Occupational Risk Assessment for Christmas Tree Scenario***

  HED Response: The revised assessment is based on information gathered during a recent tour of North Carolina Christmas tree growers. This tour identified two methods that are predominately used to apply disulfoton to this crop – motorcycle drawn granular spreaders and bucket / spoon. Exposure monitoring data have not been submitted for these two scenarios. However, PHED contains data from fairly similar scenarios – tractor-drawn granular spreader and granular baits dispersed by hand. Tables showing the revised assessments for Christmas trees are included at the end of this memo.

- ***Review ORETF study on granular application with push type spreader (MRID 449722-01). See Health Canada/PMRA review. Can we accept the Canadian review and use this study?***

  HED Response: During the August 3, 2000 meeting between Lois Rossi, Director of SRRD, Margaret Stasikowski, Director of HED, Dick Collier, Agricultural Reentry Task Force (ARTF) representative, and Leah Rosenheck, Outdoor Residential Exposure Task Force (ORETF) representative, the decision was made that HED would obtain the Health Canada reviews of the studies (if available) conducted by the ORETF and review these studies for use by OPP in making regulatory decisions. A two month timeframe for review was agreed to by all participants. After review of the studies, and the concurrence by other regulatory agencies, the results will be available for use in iREDs. This information will likely be available for incorporation into the disulfoton iRED in the October timeframe.

- ***Review information on closed loading system for liquid emulsifiable concentrate (Secure Lock G). Does this compare with the scenario for engineering controls in the worker risk assessment? Does this system provide any additional mitigation?***

  HED Response: Securalink G™ is a closed transfer system for liquids. To my knowledge, HED has not received **any** exposure data specific to this system. Therefore, the best available data for this type of system is that from PHED for the use of engineering controls during mixing/loading (closed system mixing/loading). Based on available information, HED cannot determine whether this system would provide additional mitigation. Anecdotal reports from other registrants indicate that this system is being successfully adopted by growers. It appears that the growers are frustrated with the lack of a method to add less than a full container of pesticide to their spray tanks and will cut the transfer system off of the product container. The veracity of these reports is unknown.

- ***Determine whether workers are exposed > 30 days. What is the likelihood of intermediate term exposure? (Get guidance from BEAD and stakeholders.) Is disulfoton applied by professional applicators?***

  HED Response: HED currently defines intermediate-term exposure as that occurring between 7 and 30 days. By this definition, disulfoton applicators would have exposures of intermediate-term duration. Considering the diversity of crops that can be treated with disulfoton, it is likely that some of the application is done commercially.

- ***Discuss re-entry assessment with SRRD. Is post application risk assessment relevant to all crops or to field crops only? Need to discuss re-entry exposure for hand activities vs. non-hand activities.***

  HED Response: Because disulfoton applications are usually soil directed and soil incorporated, HED has not been able to identify activities that would result in high worker exposures to treated plant surfaces. Until such activities are identified, HED recommends continuing the use of the interim REI based on the acute toxicity category of disulfoton (Toxicity Category I).

Residential Issues

- ***Determine impact of rate reductions on residential MOEs.***

HED Response: Bayer proposed the following maximum use rates (for their 1 percent homeowner product) in their public response to the preliminary risk assessment:

Crop / Use Site	Public Comment Rate	Preliminary Risk Assessment Rate	Impact
Roses	2 oz. per rose bush (=0.00125 lb ai per bush)	0.00188 lb ai per bush	50 percent rate reduction
Flowering Shrubs	4 oz. per ft. height of shrub (= 0.01 lb ai per 4 ft shrub)	0.01 lb ai per 4 ft shrub	No impact
Flower Garden	4 oz. per 12 ft^2 (= 0.21 lb ai per 1000 ft^2)	Range of 0.005 lb ai per 1000 ft^2 to 0.3 lb ai per 1000 ft^2	No impact

- ***Determine whether ORETF data can be used.***

HED Response: See response to similar question under "Occupational Issues."

- ***Review Brushkin-Goldring survey data for information to refine estimate of number of roses treated and exposure duration for resident handlers.***

HED Response: Based on the information provided, the Brushkin-Goldring survey is a random digit dialing probability samples of all households with telephones in the United States. There are discrepancies in the survey. For example, Table 1 (Number of Rose Bushes Have on Property) indicates 407 positive responses (unweighted). However, only 273 (66 percent) responses in the same table indicate either the number of roses or "Don't know / no response." The missing 134 responses are not explained. Further, an analysis of the partial data presented indicates a mean number of roses per household to be 8.9 (not 6.9 or 7.9 as reported by Bayer). These survey data will not be used until a complete data set is provided and verified.

- ***Provide comments on proposed exposure monitoring study.***

HED Response: Comments were provided to Christina Scheltema via e-mail and by phone.

Revised Assessment for Christmas Trees: Occupational Handler Dermal and Inhalation Exposures to Disulfoton at Baseline

Exposure Scenario	Baseline Dermal Unit Exposure[a] (mg/lb ai)	Baseline Inhalation Unit Exposure[b] (μg/lb ai)	Application Rates[c] (lb ai/acre)	Crop	Amount Treated per Day[d]	Daily Dermal Exposure[e] (mg/day)	Daily Inhalation Exposure[f] (mg/day)
Mixer/Loader Exposure							
Loading Granulars for Motorcycle-Drawn Spreader Application (tractor-drawn spreader used as a surrogate)	0.0084	1.7	4.5 lb ai/acre	Christmas Trees	50 acres	1.9	0.38
Applicator Exposure							
Applying Granulars with a Motorcycle-Drawn Spreader (tractor-drawn spreader used as a surrogate)	0.0099	1.2	4.5 lb ai/acre	Christmas Trees	50 acres	2.2	0.27
Mixer/Loader/Applicator Exposure							
Loading/Applying Granulars with Bucket and Spoon (granular baits dispersed by hand used as a surrogate)	100	470	0.0141 lb ai/tree	Christmas Trees	17,000 trees treated per day[g]	24,000	110

Footnotes:

a Baseline Dermal Unit Exposure values are taken from PHED (V1.1), and represent long pants, long sleeved shirt, no gloves, open mixing/loading, and open cab tractors.
b Baseline Inhalation Unit Exposure values are taken from PHED (V1.1), and reflect no respiratory protection.
c Application rates based on that reported by North Carolina Christmas tree growers.
d Amount Treated Per Day are that reported by the North Carolina Christmas Tree growers.
e Daily Dermal Exposure (mg/day) = Dermal Unit Exposure (mg/lb ai) * Application Rate (lb ai/acre) * Amount Handled Per Day (acres/day).
f Daily Inhalation Exposure (mg/day) = Inhalation Unit Exposure (μg/lb ai) * (1 mg/1000 μg) Conversion * Application Rate (lb ai/acre) * Amount Handled Per Day (acres/day).
g Number of trees treated per day is based on that reported by North Carolina Christmas tree growers (1700 trees per acre * 10 acre farm treated in 1 day).

Revised Assessment for Christmas Trees: Occupational Handler Short-term and Intermediate-term Risks from Disulfoton at Baseline

Exposure Scenario	Crop	Application Rate (lb ai/acre)[a]	Amount Treated per Day[b]	Baseline Dermal			Baseline Inhalation		Baseline Total	
				Daily Dose (mg/kg/day)[c]	Short-term MOE[d]	Int.-term MOE[e]	Daily Dose (mg/kg/day)[f]	MOE[g]	Short-term MOE[h]	Int.-term MOE[i]
Mixer/Loader Risk										
Loading Granulars for Motorcycle-Drawn Spreader Application (tractor-drawn spreader used as a surrogate	Christmas Trees	4.5	50 acres	0.027	15	0.4	0.0055	8	5	0.38
Applicator Risk										
Applying Granulars with a Motorcycle-Drawn Spreader (tractor-drawn spreader used as a surrogate)	Christmas Trees	4.5	50 acres	0.032	13	0.34	0.0039	12	6	0.33
Mixer/Loader/Applicator Risk										
Loading/Applying Granulars with Bucket and Spoon (granular baits dispersed by hand used as a surrogate)	Christmas Trees	0.0141 lb ai/tree	17,000 trees	340	0.0012	0.00003	1.6	0.028	0.0011	0.00003

Footnotes:

a Application rates based on that reported by North Carolina Christmas tree growers.
b Amount Treated Per Day are that reported by the North Carolina Christmas Tree growers.
c Baseline Daily Dermal Dose (mg/kg/day) = Daily Dermal Exposure (mg/day) / Body Weight (70 kg).
d Baseline Dermal Short-term MOE = NOAEL (0.4 mg/kg/day) / Baseline Daily Dermal Dose (mg/kg/day).
e Baseline Dermal Intermediate-term MOE = NOAEL (0.03 mg/kg/day) / [Baseline Daily Dermal Dose (mg/kg/day) * 0.36 Dermal Absorption Factor].
f Baseline Daily Inhalation Dose (mg/kg/day) = Daily Inhalation Exposure (mg/day) / Body Weight (70 kg)).
g Inhalation MOE = NOAEL (0.045 mg/kg/day) / Baseline Daily Inhalation Dose (mg/kg/day).
h Total Short-term MOE = 1/[(1/Short-term Dermal MOE) + (1/Inhalation MOE)].
i Total Intermediate-term MOE = 1/[(1/Intermediate-term Dermal MOE) + (1/Inhalation MOE)].

Revised Assessment for Christmas Trees: Occupational Handler Short-term and Intermediate-term Risks from Disulfoton with Additional PPE

Exposure Scenario	Crop	Application Rate (lb ai/acre)[a]	Amount Handled per Day[b]	Dermal - Additional PPE[c]				Inhalation - Additional PPE[d]			Total - Additional PPE	
				Unit Exposure (mg/lb ai)	Daily Dose (mg/kg/day)[e]	Short-term MOE[f]	Int.-term MOE[g]	Unit Exposure (μg/lb ai)	Daily Dose (mg/kg/day)[h]	MOE[i]	Short-term MOE[j]	Int.-term MOE[k]
Mixer/Loader Risk												
Loading Granulars for Motorcycle-Drawn Spreader Application (tractor-drawn spreader used as a surrogate)	Christmas Trees	4.5	50 acres	0.0034	0.011	37	0.99	0.34	0.0011	41	19	0.97
Applicator Risk												
Applying Granulars with a Motorcycle-Drawn Spreader (tractor-drawn spreader used as a surrogate)	Christmas Trees	4.5	80 acres	0.0042	0.014	30	0.08	0.24	0.0008	58	20	0.79
Mixer/Loader/Applicator Risk												
Loading/Applying Granulars with Bucket and Spoon (granular baits dispersed by hand used as a surrogate)	Christmas Trees	0.0141lb ai / tree	17,000 trees	40	140	0.003	0.0001	47 OV Respirator[l]	0.16	0.28	0.0029	0.0001
								94 Dust/mist Respirator[l]	0.32	0.14	0.0029	0.0001

Footnotes:

a Application rates based on that reported by North Carolina Christmas tree growers.
b Amount Treated Per Day are that reported by the North Carolina Christmas Tree growers.
c Additional PPE for all scenarios includes double layer of clothing (50% PF for clothing, except scenario 2, for which double layer data were available), and chemical resistant gloves. Flagger exposure values (scenarios 14 and 15 are based on double layer of clothing and no gloves).
d Additional PPE represents dust/mist respirator (5-fold PF) which labels state use an OV respirator (10-fold PF).
e Daily Dermal Dose (mg/kg/day) = Daily Dermal Exposure (mg/day)/ Body weight (70 kg).
f Short-term Dermal MOE = NOAEL (0.4 mg/kg/day)/ Daily Dermal Dose (mg/kg/day).
g Intermediate-term Dermal MOE = NOAEL (0.03 mg/kg/day)/Absorbed Daily Dermal Dose (mg/kg/day). Absorbed Dermal Dose = Daily Dermal Dose * 0.36 Dermal Absorption Factor.
h Daily Inhalation Dose (mg/kg/day) = Daily Inhalation Exposure (mg/day)/ Body weight (70 kg).
i Inhalation MOE = NOAEL (0.045 mg/kg/day)/ Daily Inhalation Dose (mg/kg/day).
j Total Short-term MOE = 1/ [(1/ Short-term Dermal MOE) + (1/ Inhalation MOE)].
k Total Intermediate-term MOE = 1/ ((1/ Intermediate-term Dermal MOE) + (1/Inhalation MOE)).
l OV respirator (10-fold PF), dust/mist respirator (5-fold PF)

Revised Assessment for Christmas Trees: Occupational Handler Short-term and Intermediate-term Risks from Disulfoton with Engineering Controls

Exposure Scenario	Crop	Application Rate (lb ai/acre)[a]	Amount Handled per Day[b]	Dermal - Engineering Controls[c]				Inhalation - Engineering Controls[c]			Total - Engineering Controls	
				Unit Exposure (mg/lb ai)[d]	Daily Dose (mg/kg/day)[e]	Short-term MOE[f]	Int.-term MOE[g]	Unit Exposure (μg/lb ai)[d]	Daily Dose (mg/kg/day)[e]	MOE[h]	Short-term MOE[i]	Int.-term MOE[j]
Mixer/Loader Risk												
Loading Granulars for Motorcycle-Drawn Spreader Application (tractor-drawn spreader used as a surrogate	Christmas Trees	4.5	50 acres	0.00017	0.0005	730	20	0.034	0.0001	410	260	19
Applicator Risk												
Applying Granulars with a Motorcycle-Drawn Spreader (tractor-drawn spreader used as a surrogate	Christmas Trees	Scenario Not Feasible										
Mixer/Loader/Applicator Risk												
Loading/Applying Granulars with Bucket and Spoon (granular baits dispersed by hand used as a surrogate	Christmas Trees	Scenario Not Feasible										

Footnotes:

a Application rates based on that reported by North Carolina Christmas tree growers.
b Amount Treated Per Day are that reported by the North Carolina Christmas Tree growers.
c Engineering Controls are: closed mixing and loading , single layer of clothing, and chemical resistant gloves; Closed loading of granulars; single layer of clothing, no gloves and enclosed cockpit or cab
d Unit Exposure Values = From PHED V1.1 dated May 1997.
e Daily Dose (mg/kg/day) = Daily Inhalation Exposure (mg/day)/ Body weight (70 kg).
f Short-term Dermal MOE = NOAEL (0.4 mg/kg/day)/ Daily Dermal Dose (mg/kg/day).
g Intermediate-term Dermal MOE = NOAEL (0.03 mg/kg/day)/ Absorbed Daily Dermal Dose (mg/kg/day), which is Daily Dermal Dose * 0.36 (dermal absorption factor).
h Inhalation MOE = NOAEL (0.045 mg/kg/day) / Daily Inhalation Dose.
i Total Short-term MOE = 1/ ((1/ Dermal MOE) + (1/ Inhalation MOE)).
j Total Intermediate-term MOE = 1/ ((1/ Dermal MOE) + (1/ Inhalation MOE)).