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OFFICE OF  
PESTICIDES AND TOXIC SUBSTANCES

Memorandum

Subject: Revised Simazine Dietary Exposure for Special Review.  
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DEB has been asked to revise the anticipated residues previously determined for simazine (M. Metzger, 1/19/90) to reflect total residues containing the triazine ring rather than parent plus chlorometabolites only, as previously done. A complete review of the available simazine metabolism data was not done because the additional information which could be gained in doing this is limited, and the review would require much time, while more extensive and more recently generated metabolism data are available for atrazine and can be translated to simazine. Translation of atrazine metabolism data to simazine in this case (for anticipated residue determination) is acceptable since we are interested in total residues of the stable triazine ring which would likely be similar for the two pesticides.

As described for atrazine (M. Metzger, 5/3/90), adequate information to revise anticipated residues to reflect total triazine residues resulting from simazine (atrazine) applications are available only for field corn, sorghum and animal commodities. Since simazine is not used on sorghum we will restrict our discussion to anticipated residues for corn, and anticipated residues for animal products likely to result from consumption of corn grain containing simazine residues. Since

simazine is not applied to any other nationally important animal feeds, and since no detectable residues were found in locally important animal feeds (parent plus chlorometabolites only, data not available for total triazine residues), potential residues in other animal feeds will not be considered when determining secondary residues in animal commodities.

Simazine may be applied pre-plant or preemergence to corn at rates up to 4.0 lbs.a.i./A. Since this is the same maximum application rate used to determine atrazine anticipated residues, and since we are translating from atrazine field metabolism data to determine anticipated residues for simazine (total triazine residues, see Table 1 below taken from M. Metzger, 5/3/90), we estimate the following anticipated residues of simazine on corn (the percent crop treated, %CT, in all cases is 2%):

Table 1: Anticipated Residues in Corn Commodities

<u>Commodity</u>	<u>Anticipated Residue (ppm)</u>		
	<u>Previous</u>	<u>Without %CT</u>	<u>With %CT</u>
Corn, grain	0.05	0.1	0.002
, forage	0.10	5.0	0.1
, fodder / silage	0.15	3.0	0.06
, processed fxns	0.05	3.0	0.06

Table 2: Distribution of the Total Radioactivity in Corn Treated with <sup>14</sup>C Atrazine or <sup>14</sup>C Hydroxyatrazine

<u>Study</u>	<u>Commodity<sup>1</sup></u>	<u>App. Rate<sup>2</sup></u> <u>(lbs.a.i./A)</u>	<u>Total Radioactivity (ppm)</u>		
			<u>Stalks</u>	<u>Hulls/ Cobs</u>	<u>Grain</u>
ABR-79001	corn (F)	3.0 (pre-E)	2.6	0.13	0.05
ABR-87093	(GH)	2.0 (pre-E)	5.29	0.45	0.30
GAAC-71022	(F)	3.0 (pre-E)	0.76	0.18	0.03
	(GH)	4.0 (pre-E)	6.8	0.6	0.06
GAAC-72122	(F)	4.0 (post-E)	5.42	0.25	0.07
GAAC-75083R/ GAAC-76011R	(GH)	3.0 (pre-E)	4.4	0.47	0.11
ABR-79087	(F)	3.0 (pre-E)	0.86	0.16	0.05
GAAC-73045 <sup>3</sup>	(GH)	3.0 (pre-E)	0.98	-	-

<sup>1</sup>GH = greenhouse-grown, F = field-grown

<sup>2</sup>post-E = post-emergence application, pre-E = preemergence app.

<sup>3</sup><sup>14</sup>C hydroxyatrazine applied to corn

The animal diets considered in determining anticipated residues for animal commodities are the same as those used for atrazine

(see M. Metzger, 5/3/90, for a more detailed discussion). Cattle diets are shown below in Tables 3 and 4.

Table 3: Beef Cattle Diets

<u>Feed Item</u>	<u>Anticipated Residue (biosynth) (ppm)<sup>1</sup></u>	<u>Percent (%) in Diet</u>					
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
Corn silage	0.06	82.2	58.7	16.7	69.3	38.4	16.8
Corn grain	0.002	0	0	0	11	57.6	80.7
Soybean meal	0	2.7	0.7	0	3.1	1.6	0
Barley	0	13.7	40	80	0	0	0
Alfalfa	0	0	0	0	15.7	0	0
Other	0	1.4	0.6	3.3	0.9	2.4	2.5

<sup>1</sup>Percent crop treated values are incorporated into these anticipated residues

Table 4: Dairy Cattle Diets

<u>Feed Item</u>	<u>Anticipated Residues % Crop treated Incorp.</u>	<u>Percent (%) in Diet</u>			
	<u>Biosynth</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Grass hay	0	0	10	20	30
Alfalfa	0	25	17	8	0
Corn silage	0.06	25	25	25	25
Oats	0	16	10	5	0
Wheat middlings		10	7	3	0
Corn grain	0.002	15	18	21	23
Soybean meal	0	3	7	11	15
Linseed oil	0	5	5	5	5
Other	0	1	1	2	2

Two studies were used in conjunction with these cattle dietary burdens to determine secondary residues in cattle tissues and milk: GAAC-71021 (corn biosynthesized silage and grain metabolites fed to goats at 0.95 ppm and 0.012 ppm respectively, MRID No. 412098-06) and ABR-89054 (corn biosynthesized grain metabolites fed to goats at 0.32 ppm, MRID No. 412098-08). Results of these studies are shown in Table 5 on the next page.

For broilers (poultry), the dietary burden was calculated using a poultry diet consisting of corn grain (65.2%, 0.002 ppm anticipated residue), soybean meal (26.4%, 0 ppm), and other feeds (8.4%, 0 ppm). For laying hens, the dietary burden was calculated using a poultry diet consisting of corn grain (61%, 0.002 ppm anticipated residue), milo sorghum grain (10%, 0 ppm),

Table 5: Total Radioactive Residues in Animal Tissues, Milk and Eggs Following Dosing with  $^{14}\text{C}$  Atrazine,  $^{14}\text{C}$  Hydroxyatrazine (G-34048),  $^{14}\text{C}$  G-28273, or  $^{14}\text{C}$  Biosynthesized Metabolites (Corn or Sorghum)

$^{14}\text{C}$ Animal	Chemical	Dose (ppm Feed)	Residue (Total $^{14}\text{C}$ Activity, ppm)					Eggs <sup>1</sup>
			Liver	Kidney	Meat	Fat	Heart	
Cows	atrazine	28	3.58		1.09	0.26		0.67
		6.8	0.87		0.24	0.15		0.12
Goats		0.62	0.11		0.02	0.01		0.01
	G-34048	0.62	0.007	0.004	0.0006	<0.0005	0.0008	0.003
	atrazine	44	4.6	3.45	1.13		1.05	0.70
		33	5.16	3.32	0.95	0.10		0.63
		27.2	3.03	1.76	0.54	0.06	0.54	0.89
		5	1.26	0.81	0.13	0.06	0.15	0.16
	atrazine + simazine	2.5 +						
	G-28273	2.5	1.29	0.69	0.14	0.12	0.14	0.09
	biosynth <sup>2</sup>	5.8	1.3	0.98	0.34	0.09		0.172
	biosynth <sup>3</sup>	0.95	0.01	0.003	0.0008	0.0008	<0.0006	0.004
Chick	biosynth <sup>4</sup>	0.012	0.0006	<0.0006	<0.0006	<0.0006	0.0006	0.0001
	biosynth <sup>5</sup>	1.47	0.068	0.015	0.002	<0.001	0.003	0.003
	biosynth <sup>5</sup>	0.32	0.036	0.01	<0.006	<0.006	<0.006	0.003
	atrazine	58	3.32	4.62	2.76	1.77	2.4	1.4/2.6
	G-28273	50	3.15		3.40			1.15/2.5
	biosynth <sup>6</sup>	5	0.55	0.90	0.50	0.04		0.21/0.36
		0.047	0.013	0.009	ND <sup>7</sup>	ND <sup>7</sup>		0.008/0.01

<sup>1</sup>Egg residues given as whites/yolks

<sup>2</sup>Goats were fed corn silage prepared from corn grown in soil treated at 3.0 lbs.a.i./A  $^{14}\text{C}$  atrazine

<sup>3</sup>Goats were fed corn grain prepared from corn grown in soil treated at 3.0 lbs.a.i./A  $^{14}\text{C}$  atrazine

<sup>4</sup>Goat was fed milo sorghum fodder treated preemergence with  $^{14}\text{C}$  atrazine at 2.5 lbs.a.i./A in a greenhouse

<sup>5</sup>Goats were fed corn grain treated preemergence with  $^{14}\text{C}$  atrazine at 3.0 lbs.a.i./A

<sup>6</sup>Chickens were fed corn grain treated preemergence with  $^{14}\text{C}$  atrazine at 3.0 lbs.a.i./A

<sup>7</sup>ND = non-detectable residue, limit of detection not provided

soybean meal (11.5%, 0 ppm), and other feeds (17.5%, 0 ppm) (poultry diets taken from Feeds and Nutrition, Complete, Esminger, M.E., & Olentine, C. G., 1978). These dietary burdens were used in combination with ABR-89006 (MRID No. 412098-07) (chickens fed <sup>14</sup>C atrazine corn biosynthesized metabolites [i.e., corn grain treated with atrazine in a typical manner and harvested at a typical PHI] at 0.047 ppm in their diets) to determine anticipated residues in eggs and chicken tissues.

Based on the above data, we estimate the anticipated residues in animal commodities shown in Table 6 below.

Table 6: Anticipated Residues in Animal Products

<u>Commodity</u>	<u>Anticipated Residues (ppm)</u>	
	<u>Old</u>	<u>New</u>
Milk, national dairy cattle diet.....	0	0.00007
Meat, fat and meat by-products (except liver and kidney) of cattle, goats, hogs, horses and sheep	0	0.0001
Liver of cattle, goats, hogs, horses, and sheep.	0	0.0006
Kidney of ".....	0	0.0002
Meat, fat, and meat by-products (except liver) of poultry.....	0	0.0003
Liver of poultry.....	0	0.0004
Eggs.....	0	0.0003

#### Conclusions and Recommendations

We conclude that the revised anticipated residues shown in Tables 1 and 6 are our best estimates of total triazine residues in corn and animal products resulting from applications of simazine to corn considering the available data. We recommend that DRES/SACB be provided these values for a revised dietary exposure assessment. Additional residue field trial data and feeding studies for simazine in which total triazine residues are determined will be required to further refine these anticipated residues.

We note that residues of total triazine can be estimated only for corn and animal commodities. Anticipated residues will likely increase for other commodities when data reflecting total triazine residues are available.

cc: M. Metzger (DEB), TOX II, Simazine S.F., J. Kariya (DRES/SACB), Circu(7), RF, Simazine Reg Std. File, C. Furlow (PIB/FOD, H7506C, Rm.242)

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