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

MEMORANDUM

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

SUBJECT: Update to Captan Risk Assessment Due to Revised and Supplemented Captan Exposure Assessment.

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10/16/84

Attached are revised Captan worker risk assessments as requested. The revisions are based on Harold R. Day's memo to Ester Saito entitled "Revised and Supplemented Captan Exposure Assessment" dated October 9, 1984.

The following steps and/or assumptions have been used to calculate worker risk:

1. Calculate the agent arrival rate, r, in grams per hour. For example, if a worker is exposed to 100 mg/day of Captan, then in a typical 8 hour work day the arrival rate is 100/8 = 12.5 mg/hour.

2. Calculate the mg/day absorbed by the worker using the formula,

Total Agent Absorbed = $A(h,a,r)$

$= r\left[(h+1) - (1/a)(1-(1-a)^{h+1})\right]$

where r = arrival rate of agent in grams per hour

h = total number of hours exposed

a = absorption rate per hour of the amount of agent present

then the worker dose in mg/kg/day is $A(h,a,r)/70$.

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3. Calculate the Life Time Average Daily Dose (LADD) using the formula

LADD = (Dose acquired in one working day in mg/kg/day)

x (No. of days exposed per year/365)

x (40 years of working)/(70 years lifetime).

4. Calculate the LADD risk using the formula

LADD Risk = LADD x Q_1*

Some comments are in order with respoect to the above precedure. First, the absorption formula in (2) was derived by H. Lacayo in order to carry out R. P. Zendzian's dermal absorption procedure given in his memo (Subject: Captan, "Dermal Penetration Study) to Homer K. Hall, dated 11/18/82. Zendzian's procedure is more accurate than the previous method (i.e. multiplying the total daily dose by the dermal absorption rate and then by 8). That method may result in an overestimate of the daily dose by a factor of about 2.

Second, farm workers may work from a low of 1 hour to a high of 12 hours per day. They may wash up immediately after spraying, or not until the end of the work day. Steps (1) thru (4) assume an 8 hour work day (with the exception of Almonds and Home Gardens), a steady accumalation of the chemical on the skin throughout the day; and worker wash up immediately at the end of the 8 hour work day. This differs slightly from the Captan Risk Assessment memo (Lacayo and Litt to C. Langley dated 8/14/84) where an attempt was made to calculate exposures using estimated exposure hours for each crop.

The above common sense procedure (i.e. 8 hour work day, wash up at end of day) were arrived at through consultation with H. Day (EAD/HED). The revised worker risks are given in Table I. The supplemented worker risks are given in Table 2 and 3. Risks for workers with protective clothing can be obtained from these tables by multiplying them by .2.

TABLE I

Revised Exposure and Risk Estimates(1)

Crop	mg/days	hrs/day	Typical LADD Risk	High LADD Risk
Apple: Loader	100	8	4.6×10^{-6}	6.8×10^{-6}
Sprayer	154	8	4.7×10^{-6}	7×10^{-6}
Strawberries	9.4	8	9.2×10^{-7}	1.8×10^{-6}
Home Gardens	2	1.5	1.2×10^{-7}	1.9×10^{-7}
Almonds				
Pilot	9	4	5.3×10^{-8}	1.6×10^{-7}
Loader	800	4	5×10^{-6}	1.5×10^{-5}
Apple (Post - Harvest)	38.8	8	7.9×10^{-6}	4.2×10^{-5}
Potatoes				
Cutters	8.2	8	3×10^{-8}	8.9×10^{-7}
Planters	2.	8	7.8×10^{-8}	2.3×10^{-7}
Soybeans	9.5	8	1.6×10^{-7}	2.4×10^{-7}

(1) This table supercedes prior tables in the Risk Assessment document.

Table 2

Supplementary Crops
Mixer/Loader - No Protection Clothing

Fruit Crops	Maximum Number of Exposure per Year	Maximum LADD Risk
Apricots	4	2.5×10^{-6}
Avocado	4	2.5×10^{-6}
Blackberry	5	3.1×10^{-6}
Blueberry	10	6.2×10^{-6}
Cherries	10	6.2×10^{-6}
Citrus	2	1.2×10^{-6}
Cranberry	3	1.8×10^{-6}
Grapes	6	3.7×10^{-6}
Mangos	12	7.4×10^{-6}
Nectarine	5	3.1×10^{-6}
Peaches	5	3.1×10^{-6}
Pears	4	2.5×10^{-6}
Plum	7	4.3×10^{-6}
Pineapple	8	4.9×10^{-6}
Vegetable Crop		
Beans	8	4.9×10^{-6}
Beets	7	4.3×10^{-6}
Carrots	8	4.9×10^{-6}
Celery	13	8×10^{-6}
Cucurbits	13	8×10^{-6}
Eggplant	14	8.6×10^{-6}
Lettuce	8	4.9×10^{-6}
Peppers	20	1.2×10^{-5}
Potatoes	17	1×10^{-5}
Rhubarb	10	6.2×10^{-6}
Spinach	4	2.5×10^{-6}
Sweetcorn	10	6.2×10^{-6}
Tomatoes	13	$8 \quad 10^{-6}$
Ornamentals		
Azaleas	4	2.5×10^{-6}
Begonias	12	7.4×10^{-6}
Carnations	20	1.2×10^{-5}
Mums	20	1.2×10^{-5}
Diconda (CA)	3	1.8×10^{-6}
Turf	20	1.2×10^{-5}
Roses	20	1.2×10^{-5}
Flowers	15	9.3×10^{-6}

Table 3

Supplementary Crops
Applicator - No Protection Clothing

Fruit Crops	Arrival Rate r (mg/hr)	Dermal(1) (mg/day)	Inh (mg/day)	Dose(2) (mg/kg/day)	Maximum Days	Maximum (3) LADD Risk
Apricots	35	15.9	.06	.228	4	3.3×10^{-6}
Avocado	35	15.9	.06	.228	4	3.3×10^{-6}
Blackberry	19	8.6	1	.137	5	2.5×10^{-6}
Blueberry	19	8.6	1	.137	10	5×10^{-6}
Cherries	35	15.9	.06	.228	10	8.2×10^{-6}
Citrus	35	15.9	.06	.228	2	1.6×10^{-6}
Cranberry	19	8.6	1	.137	3	1.5×10^{-6}
Grapes	19	8.6	1	.137	6	3×10^{-6}
Mangos	40	18.2	.06	.261	12	1.1×10^{-5}
Nectarine	40	18.2	.06	.261	5	4.7×10^{-6}
Peaches	40	18.2	.06	.261	5	4.7×10^{-6}
Pears	28	12.7	.06	.182	4	2.6×10^{-6}
Plum	30	13.6	.06	.195	7	4.9×10^{-6}
Pineapple	40	18.2	.06	.261	8	7.5×10^{-6}
Vegetable Crop						
Beans	19	8.6	1	.137	8	4×10^{-6}
Beets	19	8.6	1	.137	7	3.5×10^{-6}
Carrots	19	8.6	1	.137	8	4×10^{-6}
Celery	19	8.6	1	.137	13	6.4×10^{-6}
Cucurbits	19	8.6	1	.137	13	6.4×10^{-6}
Eggplant	19	8.6	1	.137	14	6.9×10^{-6}
Lettuce	19	8.6	1	.137	8	4×10^{-6}
Peppers	19	8.6	1	.137	20	9.9×10^{-6}
Potatoes	19	8.6	1	.137	17	8.4×10^{-6}
Rhubarb	1.7	.77	.0017	.035	10	1.3×10^{-6}
Spinach	19	8.6	1	.137	4	2×10^{-6}
Sweetcorn	19	8.6	1	.137	10	5×10^{-6}
Tomatoes	19	8.6	1	.137	13	6×10^{-6}
Ornamentals						
Azaleas	19	8.6	1	.137	4	2×10^{-6}
Begonias	19	8.6	1	.137	12	5.9×10^{-6}
Carnations	19	8.6	1	.137	20	9.9×10^{-6}
Mums	19	8.6	1	.137	20	9.9×10^{-6}
Diconda (CA)	19	8.6	1	.137	3	1.5×10^{-6}
Turf	19	8.6	1	.137	20	9.9×10^{-6}
Roses	19	8.6	1	.137	20	9.9×10^{-6}
Flowers	19	8.6	1	.137	15	7.4×10^{-6}

(1) Based on $A(h,a,r) = r[(h+1)-(1/a)(1-(1-a)^{(h+1)})]$
with h=8 hours and a = 1.37 absorption rate

(2) Dose = (Dermal + Inh)/70

(3) Maximum LADD Risk = Q_1^* Dose x (# exposed day/365) x (40/70)