Shaughnessy #: 080808

Due Date: 1/13/88

To: J. Andreasen
Product Manager
Registration Division (TS-767)

From: Michael P. Firestone, Chief
Special Review Section #2
Exposure Assessment Branch
Hazard Evaluation Division (TS-769C)

Thru: Paul Schuda, Chief
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Attached please find the EAB review of...

Req./File No.: _____

Chemical: Propazine

Type Product: Herbicide

Product Name: _____

Company Name: _____

Submission Purpose: Exposure Assessment for Policy Group

ACTION CODE: _____

Date In: 12/14/87

EAB # None

Date Completed: 01/11/88

Total Reviewing Time: 3 Days

Monitoring Study Requested: ____

Monitoring Study Voluntarily: ____

Deferrals To:

_____ Ecological Effects Branch

_____ Residue Chemistry Branch

_____ Toxicology Branch

1.0 INTRODUCTION

The Registration Division and the Hazard Evaluation Division have requested an exposure assessment for the uses of propazine. The exposure assessment will be utilized to estimate nondietary risk to mixer-loaders and applicators for presentation to the OPP Policy Group. Propazine is a triazine herbicide used to control broadleaf and a few grassy weeds in sorghum, non-crop areas, and lily bulbs (Oregon Special Local Need).

2.0 PROPAZINE USE DATA

James Saulmon, Science Support Branch, Benefits and Use Division, provided "rough, preliminary" use information to the Exposure Assessment Branch (EAB) on December 30, 1987 (Estimates of Exposure Parameters for Propazine Use on Sorghum in the US). Use data were provided for sorghum, which accounts for essentially all the propazine used in the US. Propazine is applied to sorghum as a preplant and preemergent herbicide to control pigweed, cocklebur, green foxtail, lambsquarter, ragweed, kochia, and sunflower. Less than half of the propazine is applied with other herbicides. When propazine is applied with other herbicides, metolachlor is the herbicide of choice although atrazine, alachlor, cyanazine, and terbutryn are also used.

Propazine is applied to sorghum once per year at an application rate of 1.0 to 2.0 lbs a.i./acre. The average acreage of sorghum per farm is 200 acres. Propazine may be applied by ground boom equipment or aerially. When applied by ground boom by the grower,

the same individual will perform the mixing/loading and application tasks. The treatment of 200 acres at 1.0 to 2.0 lbs a.i./acre will require 200 to 400 lbs propazine and require 8.8 hours of spraying time over a two day period.

Commercial ground applications are expected to consist of a mixing/loading crew and a seperate application crew. The ground boom application of a preemergent herbicide can cover approximately 100 acres in a day. A commercial crew is estimated to apply propazine for 10 to 30 days annually. The mixer/loader would handle between 1000 lbs a.i. at 1.0 lbs a.i./acre to 100 acres/day for 10 days to 6000 lbs a.i. at 2.0 lbs a.i./acre to 100 acres/day for 30 days. Ground application will require 5.5 hours/day of spraying time.

Aerial crews will consist of a mixer/loader and pilot. A flagger is also possible. Treatment of propazine to 200 acres/day will require 0.8 hours of spraying time. A crew may be contracted to apply propazine 6 to 30 days annually. The mixer/loader would handle between 1200 lbs propazine, based on application of 1.0 lbs a.i./acre to 200 acres daily for 6 days, to 12,000 lbs propazine, based on the application of 2.0 lbs a.i./acre to 200 acres daily over 30 days. Aerial mixer/loaders usually utilize closed loading systems such as "barrel suckers".

3.0 NONDIETARY OCCUPATIONAL EXPOSURE

3.1 MIXER/LOADER EXPOSURE

To estimate the dermal exposure to mixer/loaders, EAB reviewed four studies available in the published literature. To the extent possible, exposure was estimated in which mixer/loaders wore long

pants and long-sleeved shirts. The use of protective gloves was also assumed. The exposure to mixer/loaders using closed loading systems or open pouring the concentrated pesticide were calculated separately. A summary of the exposure estimates are provided below:

I. OPEN POUR

Study	Replicates	Exposure (mg/lb ai)	Clothing
Abbott	18	0.93	Long-sleeved shirt, long pants, protective gloves

II. CLOSED LOADING

Study	Replicates	Exposure (mg/lb ai)	Clothing
Dubelman	9	0.0041	Long-sleeved shirt, long pants, protective gloves
Peoples	9	0.025	Long-sleeved shirt, long pants, protective gloves

The 18 Abbott replicates estimate dermal exposure to mixer/loaders open pouring the concentrated pesticide to be 0.93 mg/lb ai handled. The use of closed loading systems reduces the exposure received to 0.015 mg/lb ai handled.

3.2 GROUND-BOOM APPLICATOR EXPOSURE

To estimate the dermal exposure to ground-boom applicators, six studies available in the published literature were evaluated. The estimated dermal exposure for ground-boom applicators applying 1.0 lb ai/A while wearing the long-sleeved shirt and long pants is presented below. Any deviations from this clothing scenario are also identified.

Study	Replicates	Exposure (mg/hr)	Clothing
Abbott	18	40	Long-sleeved shirt, long pants
Maitlen	21	0.7	Short-sleeved shirt, long pants
Dubelman	12	0.93	Long-sleeved shirt, long pants
Wojeck	23	72	Long-sleeved shirt, long pants
Staiff	20	0.4	Short-sleeved shirt, long pants
Wolfe	7	9.4	Short-sleeved shirt, long pants

The total of 101 replicates yields a weighted geometric mean exposure of 4.6 mg/hr. The large range of 0.4 to 72 mg/hr around this geometric mean reflects the wide range of exposure that can occur to applicators during ground-boom application. Tractor type and boom equipment can greatly affect exposure. Enclosed cabs provide a physical barrier between the applicator and spray. Wojeck found that shielding the boom yielded lower exposures. Wind can blow spray drift across the applicator and increase exposure. It is reasonable to assume that depending on equipment used, weather conditions, and the personal habits of the applicator, the exposure received during any given application can fall anywhere within this range of 0.4 to 72 mg/hr.

3.3 PILOT AND FLAGGER EXPOSURE

To estimate the dermal exposure to pilots and flaggers, EAB reviewed six studies available in the published literature. To the extent possible it was assumed that the pilots and flaggers wore long-sleeved shirts and long pants. In the Maddy, Peoples, and Mumma studies the actual residue measured under the clothing was used to estimate dermal exposure. Atallah presented his data as calculated dermal exposures that assumed long pants and short-sleeved shirts that completely eliminated exposure to the covered areas of the body. The pilot exposure from the Lavy-82 study was calculated assuming the pilots wore long-sleeved shirts and long pants that completely eliminated exposure to the covered body areas. The Lavy-82 study had an insufficient number of patches to estimate exposure to the legs.

The estimated pilot exposures adjusted to an application rate of 1.0 lb ai/A are presented below.

Study	Replicates	Exposure (mg/hr)
Lavy-82	3	0.10
Maddy	4	0.021
Peoples	11	0.86
Mumma	6	0.80
Atallah	4	0.38

The exposures ranged from 0.021 to 0.86 mg/hr with a weighted mean exposure of 0.58 mg/hr.

The estimated flagger exposures adjusted to an application rate of 1.0 lb ai/A are presented as follows:

Study	Replicates	Exposure (mg/hr)
Maddy	8	0.36
Peoples	9	1.1
Atallah	3	17.2

The flagger exposure ranged from 0.36 to 17.2 mg/hr with a weighted mean of 3.2 mg/hr. The flagger estimates are for flaggers standing in the open and attempting to remain upwind of the spraying. Wind shifts can, and in the studies did, produce higher exposures.

4.0 ANNUAL NONDIETARY EXPOSURE TO PROPAZINE

As previously discussed, propazine is applied to sorghum at 1.0 to 2.0 lbs a.i./acre. A grower will handle 200 to 400 lbs a.i. in treating 200 acres annually. The required spray time is 8.8 hours. The annual grower exposure, when propazine is applied to sorghum, is as follows:

Low Application Rate

Mixer/Loader-Open Pour- 0.93 mg/lb a.i. x 200 lbs a.i./yr x 1/70 kg = 2.7 mg/kg/yr

Ground Boom Applicator- 4.6 mg/hr x 1 x 8.8 hrs/yr x 1/70 kg = 0.58 mg/kg/yr

Combined- 2.7 mg/kg/yr + 0.58 mg/kg/yr = 3.3 mg/kg/yr

High Application Rate

Mixer/Loader-Open Pour- 0.93 mg/lb a.i. x 400 lbs a.i./yr x 1/70 kg = 5.3 mg/kg/yr

Ground Boom Applicator- 4.6 mg/hr x 2 x 8.8 hrs/yr x 1/70 kg = 1.2 mg/kg/yr

Combined- 5.3 mg/kg/yr + 1.2 mg/kg/yr = 6.5 mg/kg/yr

The commercial applicator will treat 100 acres daily at 5.5 hours/day for 10 to 30 days annually. The mixer/loader will handle 1000 to 6000 lbs of propazine a year. If the mixer/loader open pours propazine, the annual exposure is estimated to range from 13 mg/kg/yr to 80 mg/kg/yr. If the mixer/loader uses a closed loading system, the annual exposure would be reduced to 0.21 mg/kg/yr to 1.3 mg/kg/yr. The applicator's annual exposure would range from 3.7 mg/kg/yr (1.0 lbs a.i./acre, 10 days annually) to 22 mg/kg/yr (2.0 lbs a.i./acre, 30 days annually).

Aerial mixer/loaders are commonly different individuals from the pilot or flagger. Closed loading systems are more common with aerial operations. Therefore, the annual exposure for an aerial mixer/loader handling between 1200 and 12,000 lbs a.i./yr is 0.13 mg/kg/yr to 1.3 mg/kg/yr. The pilot exposure would range from 0.04 mg/kg/yr (0.58 mg/hr x 1 x 0.8 hrs/day x 6 days/yr x 1/70 kg) to 0.4 mg/kg/yr (0.58 mg/hr x 2 x 0.8 hrs/day x 30 days/yr x 1/70 kg). Assuming the flagger is exposed for the same period as the pilot, annual flagger exposure is estimated to range from 0.22 mg/kg/yr (3.2 mg/hr x 1 x 0.8 hrs/day x 6 days/yr x 1/70 kg) to 2.2 mg/kg/yr (3.2 mg/hr x 2 x 0.8 hrs/day x 30 days/yr x 1/70 kg).

5.0 CONCLUSION

EAB estimated the annual exposure to mixer/loaders and applicators handling propazine as a preemergent herbicide for sorghum. The estimates based on a 70 kg individual wearing commonly used work attire that consists of a long sleeve shirt

and long pants at all times and protective gloves during mixing/loading are as follows:

Ground - Grower:	Open Pour M/L	- 2.7 to 5.3 mg/kg/yr
	Application	- 0.58 to 1.2 mg/kg/yr
	Combined	- 3.3 to 6.5 mg/kg/yr
Ground - Commercial:	Open Pour M/L	- 13 to 80 mg/kg/yr
	Closed System M/L	- 0.21 to 1.3 mg/kg/yr
	Applicator	- 3.7 to 22 mg/kg/yr
Aerial :	Closed System Mixer/Loader	- 0.13 to 1.3 mg/kg/yr
	Pilot	- 0.04 to 0.4 mg/kg/yr
	Flagger	- 0.22 to 2.2 mg/kg/yr

The above estimates have not been adjusted for the dermal absorption of propazine. The estimates are subject to revision upon receipt from BUD of the comprehensive follow-up use report planned for late February 1988.

Curt Lunchick 11 Jan 88

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