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

JUL 21 1994

MEMORANDUM

OFFICE OF  
PREVENTION, PESTICIDES AND  
TOXIC SUBSTANCES

SUBJECT: Review of Atrazine Mixer/Loader/Applicator Exposure Study

TO: Walter Waldrop, Review Manager  
Special Review and Registration Division (7508W)

FROM: Mary R.A. Clock, Biologist *Mary Clock*

THRU: Steven M. Knott, Section Head  
Special Review and Registration Section *Steven M. Knott*

Larry Dorsey, Branch Chief *Larry Dorsey*  
Occupational and Residential Exposure Branch  
Health Effects Division (7509C)

DP Barcode: D197235

Pesticide Chemical Code: 080803

EPA Reg. No.: N/A

EPA MRID No.: 43016506

Review Time: 4 Days

PHED: N/A

1.0 Introduction

Atrazine is the active ingredient in certain selective broad leaf and grass herbicides. Atrazine is classified by the Agency to be in Tox Category III for acute dermal toxicity and has been found to be a class C oncogen. Atrazine is structurally related to other triazines, also found to be oncogenic.



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### Background/Purpose

Registrant Ciba-Geigy has submitted a worker exposure study to the Agency in response to Subdivision U data requirements for mixer/loader and applicator exposure for home use and commercial turf treatment. The study focuses on worker exposure to two products: Aatrex Nine-O (90% active ingredient) and Scotts Bonus S (1.7% active).

Aatrex Nine-O is a commercial-use water-dispersible granule formulation applied as a spray. The Aatrex label states that applicators must wear long pants, long sleeved shirts or the equivalent, chemical-resistant gloves and waterproofed boots. Mixer/loaders and others who may handle the concentrate must also wear a face shield or goggles.

Scotts Bonus S is a home-use product that contains fertilizers in addition to atrazine in a "lightweight granules" formulation. Application instructions state to spread the product using a mechanical spreader. No personal protective equipment requirements are stated on the label.

## 2.0 Detailed Considerations

### Study Design

The following is a brief summary of the study, "Worker Mixer/Loader and Applicator Exposure to Atrazine," completed October 14, 1993. The attached contractor review provides more details.

Four different scenarios were characterized in the study: 1) Home use "Push Cyclone Spreader" lawn treatment, 2) Home use "Hand Cyclone Spreader" lawn treatment, 3) Pest Control Operator (PCO) mixing/loading and "handgun" spray application to client lawns, 4) Golf Course Caretaker mixing/loading and "handgun" spray application.

Home use exposure was characterized by workers using two types of Cyclone Spreaders, both commonly used mechanical fertilizer spreaders. The Push Cyclone Spreader is a hopper-equipped spreader pushed over the lawn by hand. The Hand Cyclone Spreader is a hand-held spreader with the pesticide in a zippered canvas bag. For these replicates, mixing/loading and applying were counted as one replicate.

Aatrex Nine-O was applied by "handgun" sprayers, typical of Pest Control Operator application. The spray apparatus consisted of a 100 or 125 gallon tank mounted in the back of a pickup truck and with a long hose from which the spray is directed. Mixer/loaders and applicators were monitored separately.

The study was conducted at three different sites, with each scenario represented. Eight workers were monitored for a total of 59 replicates.

### Personal Protective Equipment

Workers wore appropriate protective equipment for each of the use scenarios per label directions. Handgunner applicators and mixer/loaders wore long pants, long sleeved shirts, boots and chemical-resistant gloves. Cyclone spreader mixer/loader/applicators wore long pants, t-shirts, boots or shoes and no gloves.

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Exposure Monitoring

Dermal exposure was monitored by using 100% cotton long underwear as whole body dosimeters. Dosimeters were worn underneath work clothing. After use, the dosimeters were sectioned into four pieces and labeled before being stored on ice. Exposure to hands, face and neck was estimated by hand washes and face/neck swipes. Inhalation exposure was monitored using personal air-sampling pumps attached to glass fiber filters. Pumps were calibrated at 1.5 liters per minute.

Recoveries/Fortifications

Controls and two fortification samples were run concurrently with each set of field samples. Field recovery levels ranged between 61.5% to 98.2% (with the exception of one handwash sample), well within the Agency-accepted range of 50% to 120%.

3.0 ConclusionsSubdivision U Guidelines

The submitted study was found to be acceptable according to sections 230-236 of Subdivision U of the Pesticide Assessment Guidelines (U.S. EPA, 1986) with the exception of the following points.

\* Subdivision U requires that the application rate used in the study reflect the actual label maximum rate. In the study, both Bonus S and Aatrex Nine-O were applied at rates below either maximum label rate. Aatrex Nine-O was applied at the rate of 2.0 lb ai/acre, yet the Aatrex label allows up to 9.99 lb ai/acre for non-selective weed control on non-crop land. Bonus S was applied at a rate of 1.9 lb ai/acre in the study. The maximum application rate for Bonus S could not be determined from the label. However, the Bonus S label states that the entire package (net wt. 17.15 lbs) would treat 4000 ft<sup>2</sup> or a rate of 3.17 lb ai per acre.

OREB believes that unit exposure values reported in the study can be extrapolated to represent the maximum use rate scenario.

\*Subdivision U requires monitoring of at least five replicates at each of at least three different sites for each job function. In the study, 4 replicates for the handgun application and 4 replicates for the hand cyclone spreader application were monitored at site #3. However, overall, a total of 15 hand cyclone spreader replicates and 14 handgun replicates were monitored.

OREB believes that the omission of one replicate at site #3 will not have an appreciable effect on the quality of the exposure estimates derived from this study.

\*Subdivision U requires at least one field fortification sample per worker per monitoring period per fortification level for each matrix. Although field fortification samples were collected upon each matrix at each of three fortification levels, and for each monitoring period, they were not collected for each worker. However, overall, 119 field recovery samples were generated.

OREB believes that the number and quality of field fortifications adequately

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characterize the recovery levels of samples collected in the study.

## Other Use Scenarios

The study states that the handgun application scenario is typical for golf course uses of atrazine. However, Agency use data<sup>2</sup> has shown that while some golf courses may be treated by the handgun sprayer method, the majority are thought to be treated by mini-ground boom sprayer. Previously, the Agency has estimated the unit exposure to mini-ground boom applicators<sup>1</sup>. Unit exposure values formerly derived show that exposure levels to mini-ground boom applicators do not exceed those for handgun sprayers derived from the atrazine worker exposure study.

## Exposure Calculations

The following calculations were made using the unit exposure as reported in the study and OREB assumptions found below.

Table 1:  
Use Rates and Acreage Treated

| Scenario                              | DAILY USE                  |              | ANNUAL USE                 |              |
|---------------------------------------|----------------------------|--------------|----------------------------|--------------|
|                                       | Acres Treated <sup>2</sup> | Appl. Rate   | Acres Treated <sup>2</sup> | Appl. Rate   |
| Home Use-<br>"Bonus S" <sup>3</sup>   | 0.3 A/day                  | 3.17 lb ai/A | 0.3 A/year                 | 3.17 lb ai/A |
| PCO-<br>"Aatrex" <sup>4</sup>         | 4.6 A/day                  | 9.99 lb ai/A | 621 A/year                 | 3.96 lb ai/A |
| Golf Course-<br>"Aatrex" <sup>4</sup> | 39.6 A/day                 | 3.96 lb ai/A | 39.6 A/year                | 3.96 lb ai/A |

Table 2:  
Unit Exposure from Atrazine Worker Exposure Study

| Exposure Scenario       | Total Exposure (mg/lb ai handled) |
|-------------------------|-----------------------------------|
| Handgun Mixer/Loader    | 1.74                              |
| Handgun Applicator      | 2.12                              |
| Push Cyclone Spreader * | 16.16                             |
| Hand Cyclone Spreader * | 102.6                             |

\* Activities of mixing/loading and application are combined.

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Example Calculations:

## 1. Push Cyclone Spreader:

## Actual Daily Exposure-

$$\text{Unit Exposure X Amount Handled/ Body Weight} = \text{Daily Exposure}$$

$$16.16 \text{ mg/lb ai} \times 3.17 \text{ lb ai/A} \times 0.3 \text{ A/day} / 70 \text{ kg} = 0.22 \text{ mg/kg/day}$$

## Annual Average Daily Exposure-

$$\text{Unit Exposure X Amount Handled/ 365 days /Body Weight} = \text{Daily Exposure}$$

$$16.16 \text{ mg/lb ai} \times 3.17 \text{ lb ai/A} \times 0.3 \text{ A/day} / 365 / 70 \text{ kg} = 0.0006 \text{ mg/kg/day}$$

Table 3:  
Worker Exposure to Atrazine

|                               | DAILY EXPOSURE<br>(mg/kg/day) | AVERAGE ANNUAL<br>EXPOSURE (mg/kg/day) |
|-------------------------------|-------------------------------|----------------------------------------|
| Push Cyclone Spreader*        | 0.22                          | 0.0006                                 |
| Hand Cyclone<br>Spreader*     | 1.39                          | 0.004                                  |
| PCO-Applicators               | 1.39                          | 0.20                                   |
| PCO-Mixer/Loaders             | 1.14                          | 0.17                                   |
| Golf Course-Applicators       | 4.75                          | 0.01                                   |
| Golf Course-<br>Mixer/Loaders | 3.90                          | 0.01                                   |

\* Workers did not wear gloves.

Attachment (13 pages)

CC: M. Clock/OREB      V. Eagle/SRRD  
      K. Whitby/CCB      J. Bailey/SRRD  
      M. Beringer/CCB      Chemical File-Atrazine  
      Correspondence

1. "Exposure Assessment for the Turf Cluster Chemicals," from Mary R.A. Clock/OREB to Esther Saito/CCB, 1/4/93.

2. "Use Data for the Turf Cluster Insecticides," memo from Janet Anderson/BEAD to Larry Dorsey/OREB, 11/12/92.

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3 . Current Bonus S label.

4 . Current Aatrex Nine-O label.