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

OPP OFFICIAL RECORD
HEALTH EFFECTS DIVISION
SCIENTIFIC DATA REVIEWS
EPA SERIES 361

OFFICE OF
PREVENTION, PESTICIDES, AND
TOXIC SUBSTANCES

MEMORANDUM

DATE: September 21, 1999

SUBJECT: PP#: 6F3344. **Request for Extension of Expired Time-Limited Tolerances for Dichlormid (Safener).** DP Barcode: D248305. Case#: 260310. Submission#: S546651. PC Code: 900497.

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INTRODUCTION

Zeneca is proposing an extension of time-limited tolerances in/on field corn raw agricultural commodities (RACs) for the safener dichlormid. Expired time-limited tolerances were established at 0.05 ppm on corn, field, forage, fodder, and grain for the residues of *N,N*-diallyl dichloroacetamide (dichlormid or R25788). Dichlormid is an inert ingredient (safener) in pesticide formulations and may be applied to corn fields before and after corn plants emerge from the soil with a maximum use rate of 0.54 lb a.i./A per year. This document addresses the human health risks associated with the use of dichlormid in/on corn. This is the only registered use.

The hazard assessment was provided by William Dykstra of Registration Action Branch 1 (RAB1), the residue chemistry data review and dietary risk assessment by Susie Chun of RAB1, and the occupational/residential exposure assessment by Dana Vogel of RAB1.

EXECUTIVE SUMMARY

A revised Section B should be submitted with a rotational crop restriction to corn only. All product formulations should reflect the rotational restriction. With submission of a revised Section B, the toxicology, chemistry, and occupational exposure databases are adequate to support an **extension** of the following expired time-limited tolerances for the use of dichlormid in/on corn in terms of human health risk:

Corn, field, forage	0.05 ppm
Corn, field, grain	0.05 ppm
Corn, field, stover	0.05 ppm
Corn, pop, grain	0.05 ppm
Corn, pop, stover	0.05 ppm

Note to RD: The existing expired tolerances in the 40 CFR §180.469 need to be revised to reflect current commodity nomenclature and include corn, pop commodities. Therefore, the appropriate commodities for these tolerances are "corn, field, stover", "corn, field, forage", "corn, field, grain", "corn, pop, grain", and "corn, pop, stover".

A document detailing the toxicological data gaps for a permanent tolerance will be prepared separately. However, the following toxicology data should be submitted for a permanent tolerance:

- Chronic Feeding Study in Dogs
- 2-Generation Reproductive Study in Rats
- General Metabolism Study
- Acute Neurotoxicity Study
- Subchronic Neurotoxicity Study

The following product and residue chemistry data should be submitted for a permanent tolerance:

- Product Chemistry Data - color, physical state, odor, melting point, boiling point, water solubility, stability
- Plant Metabolism Study
- Animal Metabolism Studies
- Crop Field Trials
- Rotational Crop Study

There are no occupational/residential data gaps.

Aggregate Summary

There are no existing or proposed residential uses for dichlormid. Therefore, aggregate risk estimates include only food (dietary) and water exposure.

Acute aggregate risk estimates do not exceed HED's level of concern. Acute risk estimates resulting from aggregate exposure to dichlormid in food and water are below HED's level of concern. For the U.S. population and all subgroups, including infants and children, <11% of the acute Population Adjusted Dose (aPAD) is occupied by dietary (food) exposure. The acute dietary risk associated with the use of dichlormid on corn RACs is below HED's level of concern. The estimated maximum concentrations of dichlormid in surface and ground water are less than HED's drinking water levels of comparison (DWLOC) for dichlormid as a contribution to acute aggregate exposure. Therefore, HED concludes with reasonable certainty that residues of dichlormid in drinking water do not contribute significantly to the acute aggregate human health risk at the present time considering the use on corn.

Chronic (non-cancer) aggregate risk estimates do not exceed HED's level of concern. Chronic (non-cancer) risk estimates resulting from aggregate exposure to dichlormid in food and water are below HED's level of concern. For the U.S. population and all subgroups, including infants and children, <9% of the chronic Population Adjusted Dose (cPAD) is occupied by dietary (food) exposure. The chronic (non-cancer) dietary risk associated with the use of dichlormid on corn RACs is below HED's level of concern. The estimated average concentrations of dichlormid in surface and ground water are less than HED's DWLOC for dichlormid as a contribution to chronic (non-cancer) aggregate exposure. Therefore, HED concludes with reasonable certainty that residues of dichlormid in drinking water do not contribute significantly to the chronic (non-cancer) aggregate human health risk at the present time considering the use on corn.

Chronic (Cancer)

Dichlormid has not been classified by the Hazard Identification Assessment and Review Committee (HIARC) or HED Cancer Assessment Review Committee (CARC) in terms of potential for carcinogenicity. Therefore, no chronic (cancer) aggregate human health risk assessment was completed with this action.

Residential Exposure

There are no residential uses resulting in non-dietary exposure to infants and children at this time.

Occupational Exposure

The HIARC has identified toxicological endpoints of concern for occupational exposure. Handler exposures addressing mixer/loaders and applicators have been assessed using surrogate data available in the Pesticide Handlers Exposure Database (PHED Ver 1.1) Surrogate Table. An MOE of 100 is adequate to ensure protection for handler exposure to dichlormid via the dermal and inhalation routes. Since no potentially significant post-application exposure is expected based on the use pattern, this exposure assessment was not conducted. Short- and intermediate-term exposures are expected for workers applying dichlormid. Based on use pattern, long-term exposure is not expected. All occupational exposure scenarios yielded risk estimates below HED's level of concern for dichlormid.

TOXICOLOGICAL ENDPOINTS

The HIARC met on August 5, 1999 to select appropriate endpoints for acute and chronic dietary and short-, intermediate-, and long-term occupational exposure (dermal and inhalation) for **dichlormid**. The conclusions are presented in the following sections and summarized in Table 1. The decisions made in HIARC are only applicable to this action (Memo, J. Rowland and Brenda Tarplee, HED Doc. No. 013604, 8/5/99).

A "Tier 1" approach to risk assessment was used for this action (i.e., time-limited tolerances). The "Tier 1" approach assumes that a Food Quality Protection Act (FQPA) safety factor (SF) of 10x is retained. If risk estimates do not exceed HED's level of concern under these circumstances, then the action can go forward, noting that the SF determination applies only to the expedited action and is subject to change when the chemical undergoes full review by the FQPA Safety Factor Committee (Document, Toxicology Endpoint Selection and FQPA Process for Expedited Actions, 4/19/99)

1. Dietary

a. Acute Toxicity - General Population (including females 13-50, infants, and children)

Acute Reference Dose (aRfD) = 0.10 mg/kg/day. The aRfD is established at 0.10 mg/kg/day based on the maternal toxicity no-observed-adverse-effect-level (NOAEL) of 10 mg/kg/day from the developmental toxicity study in the rat (MRID# 44606408) and an uncertainty factor (UF) of 100 (10x interspecies extrapolation, 10x intraspecies variation). The NOAEL of 10 mg/kg/day was based on decreased body weight gains and food consumption (most significant on days 7-10 of dosing) seen at the maternal toxicity lowest observed adverse effect level (LOAEL) of 40 mg/kg/day.

$$aRfD = \frac{NOAEL}{UF} = \frac{10\ mg/kg/day}{100} = 0.10\ mg/kg/day$$

The aPAD is 0.010 mg/kg/day for dichlormid (parent only).

$$aPAD = \frac{aRfD}{(FQPA\ SF)} = \frac{0.10\ mg/kg/day}{10} = 0.010\ mg/kg/day$$

b. Chronic Toxicity

Chronic RfD (cRfD) = 0.022 mg/kg/day. The HIARC assigned a cRfD for dichlormid of 0.022 mg/kg/day using a NOAEL of 6.5 mg/kg/day (100 ppm) established from a combined chronic toxicity/ carcinogenicity study in rats and an UF of 300 (10x interspecies extrapolation, 10x intraspecies variation, 3x FIFRA Factor for data gap of chronic toxicity study in dogs). The LOAEL of 32.8 mg/kg/day (500 ppm), based on an increased incidence of liver clinical pathology/histopathology and increased liver weight in the 2-year study in rats (MRID No. 44529402).

$$cRfD = \frac{NOAEL}{UF} = \frac{6.5\ mg/kg/day}{300} = 0.022\ mg/kg/day$$

The cPAD is 0.0022 mg/kg/day for dichlormid (parent only).

$$cPAD = \frac{cRfD}{(FQPA\ SF)} = \frac{0.022\ mg/kg/day}{10} = 0.0022\ mg/kg/day$$

2. Non-Dietary

a. Short-Term Toxicity (Dermal)

In the developmental toxicity study in rats, the HIARC selected the maternal toxicity NOAEL of 10 mg/kg/day based on decreased body weight gain and food consumption at the LOAEL of 40 mg/kg/day in the rat developmental toxicity study for the short-term dermal toxicity dose/endpoint. This dose was also selected for the aRfD. The duration of the short-term dermal scenarios for dichlormid are comparable to the duration of exposure in the rat developmental toxicity study. There were no appropriate dermal toxicity studies available. Since an oral NOAEL was selected, a dermal absorption factor should be used for this risk assessment. Therefore, a default factor of 100% was used in the absence of data to provide a better estimate. This risk assessment is required.

b. Intermediate- and Long-Term (Chronic) Toxicity (Dermal)

The HIARC identified the same dose and endpoint for intermediate- and long-term dermal exposure. The HIARC selected the 2-year chronic toxicity/carcinogenicity rat feeding study with a NOAEL of 6.5 mg/kg/day (100 ppm) and a LOAEL of 32.8 mg/kg/day (500 ppm), based on an increased incidence of liver clinical pathology/histopathology and increased liver weight in the 2-year study in rats (MRID No. 44529402). This study/dose were also selected for the cRfD. Since an oral NOAEL was selected, a dermal absorption factor should be used for this risk assessment Therefore, a default factor of 100% was used in the absence of data to provide a better estimate. This risk assessment is required.

c. Dermal Penetration

Dermal penetration was not able to be determined due to the absence of appropriate dermal studies and a default value of 100% dermal penetration was selected by the HIARC.

d. Inhalation (All Durations)

The HIARC selected an inhalation NOAEL of 2 µg/L based on clinical signs, increased liver and kidney weight, gross pathology findings and non-neoplastic histopathology at the LOAEL of 19.9 µg/L (14-week inhalation study). This risk assessment is required.

e. Margin of Exposure

The HIARC determined that a MOE of 100 is adequate for occupational exposure risk assessment (Memo, J. Rowland and Brenda Tarplee, HED Doc. No. 013604, 8/5/99). A MOE of 1000 (including the10x FQPA SF) would be adequate for residential exposure.

f. Recommendation for Aggregate Exposure Risks

The HIARC recommended that for **acute and chronic exposures**, the food (dietary) and water exposures should be added and compared with the PADs.

For **short-, intermediate-, and long-term exposures**, the HIARC recommended aggregate systemic (oral), dermal and inhalation exposure risk assessments are **appropriate** due to similarities in the toxicity endpoints observed between the oral studies selected for oral and dermal exposure (decreased weight gain and food consumption in rat developmental and decreased body weight, food consumption and liver toxicity in the 2-year rat study), and inhalation routes (decreased body weight, food consumption, and liver toxicity in a 14-week inhalation study).

DETERMINATION OF CANCER RISK

Dichlormid has not been classified by the HIARC or HED CARC in terms of potential for carcinogenicity. However, there is no evidence of a positive carcinogenic effect in the rat and mouse carcinogenicity studies based on evaluation of the studies.

FQPA CONSIDERATIONS

The HIARC concluded that there is qualitative evidence of increased susceptibility demonstrated following *in utero* exposure in the prenatal developmental toxicity study in rabbits, since fetal effects observed (resorptions, decreased live fetuses per litter, and decreased fetal body weight) are considered to be more severe than those observed in maternal animals (increased alopecia, decreased body weight gain and food consumption). Based solely on the hazard assessment, with no consideration of the exposure assessments, the HIARC recommended that the FQPA SF be retained at 10x since: 1) there is qualitative evidence of increased susceptibility in the rabbit developmental study; 2) the toxicity database is incomplete - there are data gaps for the 2-generation reproduction study in rats, and acute and subchronic neurotoxicity studies. The recommendation for a developmental neurotoxicity study in rats is placed in reserve pending receipt and review of the findings of the acute and subchronic neurotoxicity studies.

Table 1- Toxicological Doses and Endpoints for Dichlormid

EXPOSURE SCENARIO	DOSE (mg/kg/day) and Factors	ENDPOINT AND TOXICOLOGICAL EFFECT	STUDY
Acute Dietary (General Population including Females 13-50 Infants & Children)	NOAEL =10 UF = 100 FQPA SF = 10	Maternal LOAEL = 40 mg/kg/day based on decreased body weight gain and food consumption (most significant on days 7-10 of dosing)	Developmental Toxicity Study in rats
		aRfD = 0.10 mg/kg/day **aPAD = 0.01 mg/kg/day**	

EXPOSURE SCENARIO	DOSE (mg/kg/day) and Factors	ENDPOINT AND TOXICOLOGICAL EFFECT	STUDY
Chronic Dietary	NOAEL = 6.5 UF = 300 FQPA SF = 10	LOAEL = 32.8 mg/kg/day (♂) based liver clinical pathology / histopathology and increased liver weight Extra 3x UF due to data gap for the chronic toxicity study in dogs.	2-year Study in Rats
		cRfD = 0.022 mg/kg/day **cPAD = 0.0022 mg/kg/day**	
Dermal Absorption	100% default; neither a dermal absorption study nor a dermal toxicity study (for extrapolation) is available in the database.		
Short-Term (Dermal)	Oral NOAEL = 10.0 MOE = 100	Maternal LOAEL = 40 mg/kg/day based on decreased body weight gain and food consumption (most significant on days 7-10 of dosing). This dose/endpoint/study was used for deriving the aRfD. Dermal toxicity study is not available. 100% dermal absorption factor should be used for this risk assessment	Developmental Toxicity Study in Rats
Intermediate- and Long-Term (Dermal)	Oral NOAEL = 6.5 MOE = 100	LOAEL = 32.8 mg/kg/day (♂) based on liver clinical pathology/histopathology and increased liver weight. This dose/endpoint/study was used for deriving the cRfD. 100% dermal absorption factor should be used for this risk assessment.	2-year Study in Rats
Inhalation (All Durations)	2 µg/L	LOAEL = 19.9 µg/L based on clinical signs, increased liver and kidney weights, gross pathology and non-neoplastic histopathology. The route of exposure in this study is appropriate for this risk assessment.	14-week Inhalation Study

DIETARY AND RESIDENTIAL EXPOSURES AND RISKS

In examining aggregate exposure, FQPA directs EPA to consider available information concerning exposures from the pesticide residues in food and all other non-occupational exposures. The primary non-food sources of exposure HED looks at include drinking water (whether from groundwater or surface water), and exposure through pesticide use in gardens, lawns, or buildings (residential and other outdoor and indoor uses). In evaluating food exposures, HED takes into account varying consumption patterns of major identifiable subgroups of consumers, including infants and children.

1. From Food and Feed Uses

Time-limited tolerances have expired (40 CFR 180.469) for the residues of dichlormid in/on field corn RACs at 0.05 ppm.

Dietary Exposure Evaluation Model (DEEM™) analyses were performed to provide an estimate of the dietary exposure and associated risk for dichlormid resulting from the proposed extension of time-limited tolerances (Memo, D258442, S. Chun, 8/11/99). The DEEM™ analysis evaluated the individual food consumption as reported by respondents in the USDA 1989-92 Nationwide Continuing Surveys of Food Intake by Individuals (CSFII) and accumulated exposure to the chemical for each commodity. Tolerance level residues and 100% crop treated (CT) were used in the DEEM™ analyses (Tier 1). The dietary exposure analyses are attached (Attachment 1).

a. Acute Dietary Exposure Analysis

An acute dietary risk assessment is required for dichlormid. Table 2 presents the results of the acute dietary exposure analysis. HED's level of concern is for exposures >100% aPAD.

Table 2 - Acute Dietary Exposure Results

Subgroups[1]	aPAD (mg/kg/day)	95th Percentile		99th Percentile		99.9th Percentile	
		Exposure (mg/kg/day)	% aPAD	Exposure (mg/kg/day)	% aPAD	Exposure (mg/kg/day)	% aPAD
U.S. Population	0.01	0.000200	2	0.000366	4	0.000605	6
All infants (<1 year)	0.01	0.000459	5	0.000682	7	0.001091	11
Nursing infants (< 1 year)	0.01	0.000157	2	0.000266	3	0.000310	3
Non-nursing infants (< 1 year)	0.01	0.000501	5	0.000745	7	0.001134	11
Children (1-6 years old)	0.01	0.000375	4	0.000563	6	0.000799	8
Children (7-12 years old)	0.01	0.000276	3	0.000393	4	0.000578	6
Hispanics	0.01	0.000219	2	0.000429	4	0.000642	6
Non-Hispanic blacks	0.01	0.000235	2	0.000421	4	0.000614	6
Females (13-29 yrs/np/nn)[2]	0.01	0.000171	2	0.000230	2	0.000322	3

[1] Population subgroups shown include the U.S. general population, all infants and children subgroups, the highest females 13-50 subgroup, and any other population subgroup whose exposure exceeds that of the U.S. general population at the 95th percentile of exposure.

[2] np= not pregnant; nn= not nursing

The results indicate that the acute dietary exposure associated with the use of dichlormid on corn RACs is below HED's level of concern at the 95th percentile of exposure.

b. Chronic Dietary Exposure Analysis

The chronic DEEM™ dietary exposure analysis used mean consumption (3-day average). HED's level of concern is for chronic dietary exposures greater than 100% cPAD. Chronic dietary exposures for the U.S. population and other subgroups are presented in Table 3. The other subgroups included represent the highest dietary exposures for their respective subgroups (i.e., infants, children, females, and males).

Table 3 - Chronic Dietary Exposure Results

Subgroups[1]	Exposure (mg/kg/day)	% cPAD
U.S. Population (48 states)	0.000064	3
All infants (<1 year)	0.000152	7
Nursing infants (< 1 year)	0.000038	2

Subgroups[1]	Exposure (mg/kg/day)	% cPAD
Non-nursing infants (< 1 year)	0.000200	9
Children (1-6 years old)	0.000149	7
Children (7-12 years old)	0.000114	5
Females (13-19/np/nn)[2]	0.000065	3
Hispanics	0.000068	3
Non-Hispanic blacks	0.000074	3
Males (13-19 yrs)	0.000082	4

[1] Population subgroups shown include the U.S. general population, all infants and children subgroups, the highest females 13-50 subgroup, and any other population subgroup whose exposure exceeds that of the U.S. general population.

[2] np= not pregnant; nn= not nursing

The results indicate that the chronic dietary exposure associated with the use of dichlormid on corn RACs is below HED's level of concern.

2. From Drinking Water:

A DWLOC is a theoretical upper limit on a pesticide's concentration in drinking water in light of total aggregate exposure to a pesticide in food, drinking water, and through residential uses. A DWLOC will vary depending on the toxic endpoint, with drinking water consumption, and body weights. Different populations will have different DWLOCs.

HED uses DWLOCs internally in the risk assessment process as a surrogate measure of potential exposure associated with pesticide exposure through drinking water. In the absence of monitoring data for pesticides, it is used as a point of comparison against conservative model estimates of a pesticide's concentration in water.

DWLOC values are not regulatory standards for drinking water. They do have an indirect regulatory impact through aggregate exposure and risk assessments.

HED does not have monitoring data available to perform a quantitative drinking water risk assessment for dichlormid at this time. The Environmental Fate and Effects Division (EFED) provided ground and surface water exposure estimates for the use of dichlormid on corn (Memo, D258095, A. Clem, 8/3/99).

a. Surface and Ground Water

Dichlormid is relatively short-lived in aerobic soil (aerobic soil "half-life" measured in one soil of approximately 7-12 days). Carbon dioxide was the only major identified aerobic soil metabolite. Its evolution from the centrally labeled carbonyl position indicates a high degree of mineralization of the dichlormid molecule. Other unidentified volatiles totaled less than approximately 3%. Minor amounts of several degradates extracted from the soil by organic solvents were not identified. Significant amounts of other soil degradates were resistant to harsher extraction and presumably remain as bound residues. Dichlormid was stable against hydrolysis and photolysis in soil and water.

Dichlormid's low sorptivity to soil (median K_d of 0.45 and median K_{oc} of 39 mL/g in four soils) indicates high mobility. Based on its low sorptivity to soil, high solubility in water (4.4 g/L), and low octanol to water partitioning ratio (K_{ow} = 69), bioconcentration is not anticipated.

Drinking water exposure estimates are based on degradation and transport factors for dichlormid coupled with EFED's current GENEEC (surface water) and SCI-GROW (groundwater) screening models for surface and ground water, respectively. Model results are for an application rate of dichlormid of 0.5 lbs/acre (Memo, D258095, A. Clem, 8/3/99).

Tier 1 GENEEC estimated environmental concentrations (EEC) are summarized in Table 4.

Table 4 - EECs for Dichlormid Use on Corn

GENEEC (µg/L) Parent and Degradate	Peak EEC	56-day EEC	56-day[1] EEC
Dichlormid	27.29	26.93	8.98

[1] HED interim policy allows the 56-day GENEEC value to be divided by 3 to obtain a value for chronic risk assessment calculations. The values in this column have been divided by 3.

Based on the SCI-GROW model, acute drinking water concentrations in shallow ground water on highly vulnerable sites are summarized in Table 5.

Table 5 - Acute Groundwater EEC for Dichlormid Use on Corn

SCI-GROW	µg/L (ppb)
Dichlormid	0.046

Chronic concentrations are not expected to be higher than acute values (Memo, D258095, A. Clem, 8/3/99).

b. Drinking Water Risk

HED's default body weights are: males - 70kg, females - 60kg, and children - 10 kg. Drinking water consumption defaults are: adults - 2 L, children - 1 L

$$DWLOC\ (\mu g/L) = \frac{water\ exposure\ (mg/kg/day)\ x\ (body\ weight)}{consumption\ (L)\ x\ 10^{-3}\ mg/\mu g}$$

DWLOCs were calculated for the U.S. general population and the children subgroup which had the highest dietary exposure. To calculate DWLOCs for acute (or chronic) exposure relative to an acute (or chronic) toxicity endpoint, the acute (or chronic) dietary food exposure (from the DEEM™ analysis) was subtracted from the aPAD (or cPAD) to obtain the acceptable acute (or chronic) exposure to dichlormid in drinking water.

Acute

HED has calculated DWLOCs for acute exposure to dichlormid in surface and ground water for the U.S. population and non-nursing infants (< 1 year old) to be **340 ppb and 95 ppb,** respectively.

Chronic

HED has calculated DWLOCs for chronic exposure to dichlormid. The DWLOCs are **75** and **20 ppb** for the U.S. population and non-nursing infants (< 1 year old), respectively.

3. From Non-Dietary Uses - Residential Exposure

There are no proposed or existing residential uses for dichlormid, therefore, no assessment was performed for residential exposure.

DETERMINATION OF SAFETY FOR U.S. POPULATION, INFANTS, AND CHILDREN

1. Acute Aggregate Risk

The acute aggregate exposure includes dietary (food) and water. From the acute dietary (food only) risk assessments, high-end exposure estimates were calculated for the U.S. Population and other subgroups. The % aPADs were below HED's level of concern at the 95th percentile for the U.S. population with an estimated acute dietary exposure of 2% aPAD. The highest dietary exposure is from an infant and children subgroup, non-nursing infants (< 1 year old), at 5% aPAD. The estimated acute dietary risk associated with the use of dichlormid on corn RACs is below HED's level of concern.

The maximum estimated concentrations of dichlormid in surface and ground water are less than HED's DWLOCs for dichlormid as a contribution to acute aggregate exposure. Therefore, taking into account the uses proposed in this action, HED concludes with reasonable certainty that residues of dichlormid in drinking water (when considered along with other sources of exposure for which HED has reliable data) would not result in unacceptable levels of acute aggregate human health risk at this time.

2. Chronic (non-cancer) Aggregate Risk

There are no registered or proposed residential uses for dichlormid. Chronic aggregate exposure will only include food and water only.

For the U.S. population, 3% of the cPAD is estimated to be occupied by dietary (food) exposure. The highest exposure is from an infants and children subgroup, non-nursing infants (< 1 year old), with an estimated dietary exposure of 9% cPAD. The estimated chronic dietary risk associated with the use of dichlormid corn RACs is below HED's level of concern.

The estimated average concentrations of dichlormid in surface and ground water are less than HED's DWLOCs for dichlormid in drinking water as a contribution to chronic aggregate

exposure. HED concludes that there is a reasonable certainty that no harm will result from aggregate chronic exposure to dichlormid residues.

3. Summary

Comparison

Tables 6 and 7 summarize the dietary and water exposure for acute and chronic exposure in the U.S. population and the highest infant and children subgroup.

Table 6 - Acute Scenario (Dichlormid)

Subgroup	aPAD (mg/kg/day)	NOAEL (mg/kg/day)	Food Exposure (from DEEM™) (mg/kg/day)	Water Exposure[1] (mg/kg/day)	SCI-GROW (ppb)	GENEEC (ppb)	DWLOC (ppb)
U.S. Population	0.01	10.0	0.000200	0.00980	0.046	27.2	340
Non-nursing infants (< 1 yr old)	0.01	10.0	0.000501	0.01676	0.046	27.2	95

[1] Water Exposure(mg/kg/day) = aPAD (mg/kg/day) - dietary exposure from DEEM™ (mg/kg/day)

Table 7 - Chronic (non-cancer) Scenario (Dichlormid)

Subpopulation	Food Exposure (from DEEM™) mg/kg/day	Water Exposure (mg/kg/day)	cPAD mg/kg/day	SCI-GROW (ppb)	GENEEC (ppb)	DWLOC (ppb)
U.S. Population	0.000064	0.00214	0.0022	0.046	8.98	75
Non-nursing infants (< 1 yr old)	0.000200	0.00200	0.0022	0.046	8.98	20

[1] Water Exposure(mg/kg/day) = cPAD (mg/kg/day) - dietary exposure from DEEM™ (mg/kg/day)

HED concludes that there is a reasonable certainty that no harm will result from acute or chronic aggregate exposure to dichlormid. HED bases this determination on a comparison of estimated concentrations of dichlormid in surface waters and ground waters to back-calculated "levels of comparison" for dichlormid in drinking water. These DWLOCs in drinking water were determined after HED has considered all other non-occupational human exposures for which it has reliable data (e.g.,dietary exposure), including all current uses, and uses considered in this action. The estimates of dichlormid in surface waters are derived from water quality models that use conservative assumptions (health-protective) regarding the pesticide transport from the point of application to surface and ground water. Because HED considers the aggregate risk resulting from multiple exposure pathways associated with a pesticide's uses, DWLOCs may vary as those uses change. If new uses are added in the future, HED will reassess the potential impacts of dichlormid on drinking water as a part of the aggregate risk assessment process.

ENDOCRINE DISRUPTOR EFFECTS

EPA is required to develop a screening program to determine whether certain substances (including all pesticides and inerts) "may have an effect in humans that is similar to an effect produced by a naturally occurring estrogen, or such other endocrine effect..." The Agency is currently working with interested stakeholders, including other government agencies, public interest groups, industry and research scientists in developing a screening and testing program and a priority setting scheme to implement this program. Congress has allowed 3 years from the passage of FQPA to implement this program. At that time, EPA may require further testing of this active ingredient and end use products for endocrine disruptor effects. EPA is currently working on a screening program.

CUMULATIVE RISK

EPA does not have, at this time, available data to determine whether dichlormid has a common mechanism of toxicity with other substances or how to include this pesticide in a cumulative risk assessment. For the purposes of this tolerance action, therefore, EPA has not assumed that dichlormid has a common mechanism of toxicity with other substances.

DETERMINATION OF SAFETY TO OCCUPATIONALLY EXPOSED WORKERS

1. Summary of Use Patterns and Formulations

Dichlormid is a safener used in acetochlor pesticide formulations to protect the crop from the herbicide action. The maximum treatment rate is **0.54 lbs safener/Acre** (personal communication, T. Alston, RD, 8/10/99). One application or two split applications may be made per year. The current use is for ground applications to corn crops (field corn, seed corn, silage, and popcorn). Applications will be made pre-emergent (up to 30 days prior to planting), or post-emergent (until the crop reaches 11 inches in height). All labels prohibit aerial applications.

2. Occupational Exposures and Assumptions

HED has identified toxicological endpoints of concern for occupational exposure. Based on the use pattern, only short- and intermediate-term exposures are expected for workers applying dichlormid. Chemical specific data for dichlormid are not available. Therefore, handler exposures (mixer/loaders and applicators) have been assessed using surrogate data available in the Pesticide Handlers Exposure Database (PHED Ver 1.1, 1998) Surrogate Table. Table 8 summarizes the HED exposure estimates for workers mixing, loading, and applying dichlormid.

HED's level of concern for occupational exposures to dichlormid is for MOEs that are below 100. The aggregate (dermal and inhalation) MOEs for the groundboom applicator are **240** and **190** for short- and intermediate-term exposures, respectively. The aggregate MOEs for the mixer/loader in support of groundboom applications are **150** and **120** for short- and intermediate-terms exposures, respectively. Therefore, all exposure estimates are below HED's level of concern.

a. Handler Assumptions and Exposure Assessment

A post-application exposure assessment was not performed. Cultural activities associated with the subject corn uses are likely to result in relatively low levels of dermal exposure. Field corn is planted, cultivated, and harvested mechanically (*website:* Crop Profiles, USDA, Office of Pest Management Policy and Pest Impact Assessment Program, updated 8/23/99). Therefore, potential worker post-application exposures from a herbicide applied pre-emergent or in the early post-emergent stage are expected to be minimal.

Table 8 - Handler Exposures to Dichlormid

Job Function-liquid formulations	Appl. Rate (lbs ai/Acre)	Unit Exposure[1] (mg/lb ai)	Acres/ Day[2]	Dermal Average Daily Dose (ADD)[3] mg/kg/day	Inhalation ADD[3] mg/kg/day	Short-term MOE[4]	Interm-term MOE[4]	Total short-term MOE[5]	Total intermediate-term MOE[5]
Open System-Ground-mixer/loader	0.54	0.023 dermal	190	0.034	0.0018	300 dermal	190 dermal	150	120
		0.0012 inhalation				300 inhalation	300 inhalation		
Open Cab-Ground-applicator	0.54	0.014 dermal	190	0.021	0.0011	490 dermal	320 dermal	240	190
		0.00074 inhalation				480 inhalation	480 inhalation		

[1] Source: Pesticide Handlers Exposure Database (PHED) V1.1, Surrogate Exposure Table. All data is rated High Confidence with the exception of the dermal unit exposure for the ground applicator which is Medium Confidence.
[2] Assumptions regarding acreage treated/day from 1997 Agriculture Census. Average farm size is **190 acres** for the state with the largest acreage of corn (Iowa). Assumes that a commercial applicator can treat an entire farm in 1 day.
[3] ADD = Unit exposure(µg/lb ai) x AR x Acres/Day x 1/BW (70kg) x % Absorption (100%-inhalation and dermal)
[4] MOE = NOAEL/ADD; (where NOAEL = 10 mg/kg/day for short-term dermal; 6.5 mg/kg/day for intermediate-term dermal; 0.52 mg/kg/day (equivalent to 2ug/L) for inhalation)
[5] Total MOE = 1/{1/MOE(dermal in oral equivalents) + 1/MOE(inhalation)}

OTHER CONSIDERATIONS

1. Product Chemistry

Product chemistry was submitted and reviewed. Product chemistry data requirements remain unfulfilled as cited in the previous review (Memo, D191195, G. Kramer, 9/16/93). These deficiencies are: color (830.6303), physical state (830.6303), odor (830.6304), melting point/melting range (830.7200), boiling point/boiling range (830.7220), water solubility (830.7840 or 830.7860), stability to sunlight, normal, and elevated temperatures, metals, and metal ions (830.6313). The registrant should submit these data.

2. Directions for Use

There are many product formulations for dichlormid, each containing a different amount of dichlormid. The highest application rate from all the formulations is 0.54 lbs dichlormid/A

[redacted]

Dichlormid is a safener for acetochlor. Two products, Fultime™ and Surpass® 100, contain atrazine and acetochlor as active ingredients. The other four products, TopNotch™, Surpass® 7E, Surpass® 20-G, and Surpass® EC, contain only acetochlor as the active ingredient. All products specify use on field corn, production seed corn, silage corn, and popcorn. In all formulations, soil type and organic matter content determined the maximum application rate, with fine soil having the highest application rate. No aerial application is allowed. Application through sprinkler irrigation systems is prohibited. Tank mixing with other herbicides such as Atrazine, Bladex, 2,4-D, Accent, Beacon and Banvel is on the labels.

Table 10 summarizes the formulations.

Table 10 - Dichlormid Formulations and Use Rates

Product	Other Active(s)	Type of formulation	Use Rate of dichlormid (ai)	Rotation Restrictions
Surpass® 100 Selective Herbicide	Acetochlor Atrazine	Liquid	Conventional Tillage Systems: Maximum application of [redacted] lbs ai/A, which is dependent on soil type and organic matter. Application must be made within 14 days prior to planting, after planting, pre-emergence of corn, and post-emergence (up to 11" tall). In no-till systems, a maximum of [redacted] lb. ai/A, which is dependent on soil type. The application may be split: 60% up to 30 days before planting, the remaining 40% should be applied after planting. Use a minimum of [redacted] gallons/A in broadcast boom equipment for ground applications.	Corn, soybeans, and sorghum may be planted the spring following application. Tobacco may be planted the spring following application. Wheat may be planted 15 months following treatment. Because of atrazine carryover, injury may occur to tobacco or wheat. Do not rotate to crops other than corn, soybeans, sorghum, tobacco or wheat.
Fultime™ Herbicide	Acetochlor Atrazine	Liquid	Conventional Tillage Systems: Maximum application of [redacted] lbs ai/A, which is dependent on soil type and organic matter content. Application must be made within 14 days prior to planting, after planting, pre-emergence of corn, and post-emergence (up to 11" tall). In no-till systems, a maximum of [redacted] lbs ai/A, which is dependent on soil type and time of application relative to planting. The application may be split: 60% up to 30 days before planting, the remaining 40% should be applied at or after planting. Use a minimum of [redacted] gallons/A in broadcast boom equipment for ground applications	Corn, soybeans, and sorghum may be planted the spring following application. Tobacco may be planted the spring following application. Wheat may be planted 15 months following treatment. Because of atrazine carryover, injury may occur to tobacco or wheat. Do not rotate to crops other than corn, soybeans, sorghum, tobacco or wheat the year following the application of FULTIME™.

Product	Other Active(s)	Type of formulation	Use Rate of dichlormid (ai)	Rotation Restrictions
Surpass® 7E Herbicide	Acetochlor	Emulsifiable	Do not apply more than [redacted] lbs ai/A per season. Conventional Tillage Systems: Maximum application of [redacted] lbs ai/A, which is dependent on soil type and organic matter content. Application must be made within 14 days prior through emergence of the corn. In no-till systems, a maximum of [redacted] lbs ai/A, which is dependent on soil type and time of application relative to planting. The application may be split: 60% up to 30 days before planting, the remaining 40% should be applied at or after planting. Use a minimum of [redacted] gallons/A in broadcast boom equipment for ground applications	(1) If crops treated with Surpass 7E is lost, field corn, production seed corn, silage corn or popcorn may be replanted immediately. Do not make a second application of Surpass 7-E. (2) Do not rotate to crops other than corn, soybeans, sorghum, wheat, or tobacco. Wheat may be planted 4 months after application. Corn, soybeans, sorghum, or tobacco may be planted the spring following application.
Surpass® EC Herbicide	Acetochlor	Emulsifiable Concentrate	Do not apply more than [redacted] lbs ai/A of Surpass EC per season. Use a minimum of 10 gallons in broadcast boom equipment for ground applications. Planting should be done within 30 days of application of Surpass EC. Conventional Tillage Systems: Maximum application of [redacted] lbs ai/A, which is dependent on soil type and organic matter content. Application must be from 2 weeks through emergence of corn. In no-till systems, a maximum of [redacted] lbs ai/A, which is dependent on soil type. The application may be split: 60% up to 30 days before planting, the remaining 40% should be applied after planting.	(1) If crops treated with Surpass EC is lost, field corn, production seed corn, silage corn or popcorn may be replanted immediately. Do not make a second application of Surpass EC. (2) Do not rotate to crops other than corn, soybeans, sorghum, wheat, or tobacco. Wheat may be planted 4 months after application. Corn, soybeans, sorghum, or tobacco may be planted the spring following application.
Surpass 20-G Granular Herbicide	Acetochlor	Granular	A maximum use rate of [redacted] lbs ai/A, depending on soil type and organic matter. For post emergence: Application of Surpass 20-G may follow any preplant or pre-emergence herbicide application including those made with Surpass 20-G, Surpass EC, Surpass 100, or TopNotch™ as long as the total lbs. of acetochlor/A does not exceed 3 lbs.	Corn, soybeans, sorghum or tobacco may be planted the spring following application. Wheat may be planted 4 months after application. Do not rotate to crops other than corn, soybeans, sorghum, tobacco, or wheat.
TopNotch™ No-Till Herbicide	Acetochlor	Micro-encapsulate (Mcap)	Application can take place from up to 40 days prior to planting. The maximum application rate is [redacted] lbs ai/A depending on soil type and organic matter.	Corn, soybeans, sorghum or tobacco may be planted the spring following application. Wheat may be planted 4 months after application. Do not rotate to crops other than corn, soybeans, sorghum, tobacco, or wheat.

INERT INGREDIENT INFORMATION IS NOT INCLUDED

A summary of the proposed application timing and conditions is provided in Table 11.

Table 11 - Application timing and conditions for Dichlormid formulations

APPLICATION TYPE	CONDITIONS				
	Surpass® 100 Selective Herbicide	Fultime™ Selective Herbicide	Surpass® 7E Herbicide Surpass® EC Herbicide	Surpass® 20-G Granular Herbicide	TopNotch™ No-Till Herbicide
early preplant	On medium and fine textured soils, may be applied ≤ 30 days before planting	On medium and fine textured soils, may be applied ≤ 40 days before planting	≤ 30 days before planting	Use on medium- and fine- textured soils with minimum tillage or no tillage systems. Apply ⅔ of the recommended broadcast rate as a split treatment 30-45 days before planting and the remainder immediately before planing, or at planting. Applications ≤ 30 days before planting may be made either as a split or a single treatment. Course soils- Apply ≤ 2 weeks before planting.	≤ 40 days before planting
preplant incorporate	In top 2" anytime ≤ 14 days before planting.				In top 2" anytime ≤ 10 days before planting.
pre-emergence surface	Soil surface as a broadcast or banded application.				
postplant-pre-emergence	immediately after planing but prior to corn emergence	-----	immediately after planting but prior to corn emergence	-----	immediately after planting but prior to corn emergence
banding- pre-emergence	applied in a 10 to 14 inch band after planting but before emergence				
broadcast-early post emergence	early post-emergence up to 11" tall corn[1]				

[1] in Surpass®20-G label, called Lay-by (Cultivation) Application

Revised Section B should be submitted with rotational crop restrictions as detailed in Section 10 - Rotational Crop Restrictions.

3. Nature of the Residue - Plants

No data pertaining to the metabolism of dichlormid have been submitted. The nature of the residue in corn was previously found to be understood based on the published metabolism studies for a structurally similar chemical, Randox® (N,N-diallyl-2-chloroacetamide). It was concluded that the metabolism of dichlormid would follow the pathway determined for Randox® (Memo, W. Chin, 7/2/86): dichlormid is likely oxidized by plants to glyoxylic acid, which is incorporated into naturally occurring plant constituents (Memos, W. Chin, 7/2/86; PP#2F1273, E. Gunderson, 9/6/72).

Under current OPPTS Guideline 860.1300, Nature of the Residue- Plants, Livestock, plant

metabolism studies are required for the subject crops. Therefore, **the registrant should submit a plant metabolism study in accordance with OPPTS guidelines 860.1300.**

Currently the tolerance expression includes parent dichlormid only. HED will refer to the Metabolism Assessment Review Committee (MARC) on the toxicological significance of metabolites once the plant metabolism study has been submitted and reviewed. **If any metabolites are then found by the MARC to have toxicological significance, a revised Section F, additional field studies, analytical methodology, and storage stability data may be needed.**

4. Nature of the Residue - Animals

No animal metabolism data were submitted for dichlormid. Under current OPPTS Guideline 860.1300, Nature of the Residue- Plants, Livestock, "*...Animal metabolism studies are required whenever a pesticide is applied directly to livestock or to crops or crop parts used for feed, or when livestock premises are to be treated...*" Field corn is considered an animal feed item; therefore, animal metabolism studies are required for ruminants and poultry. **The registrant should submit animal metabolism studies in accordance with current OPPTS Guideline 860.1300.**

HED will refer to the MARC on the toxicological significance of metabolites once the animal metabolism studies have been submitted and reviewed. **If any metabolites are then found by the MARC to have toxicological significance, a revised Section F, analytical methodology, magnitude of residue in meat, milk, poultry and eggs, and storage stability data may be needed.**

5. Analytical Enforcement Methodology - Plants

An adequate enforcement method, Tolerance Enforcement Method for the Determination of Residues of N,N-Diallyl Dichloroacetamide (dichlormid, R25788) in Field Corn, Grain, Fodder, and Forage, is available. A petition method validation (PMV) was successfully completed with minor revisions recommended by the Analytical Chemistry Laboratory (ACL) (Memo, D199320, G. Kramer, 8/29/94). The registrant was requested to submit standards of dichlormid to the EPA repository and submit a revised version of the proposed analytical enforcement method. **Until the receipt of the standard and the revised method, the requirements for analytical enforcement methodology will remain unfulfilled.**

6. Multiresidue Method

A report on Multiresidue testing of dichlormid (MRID# 42773503) has been received and forwarded to FDA (Memo, G, Kramer 9/16/93). Dichlormid was evaluated using multiresidue method Protocols C, D and E. Protocol C demonstrated dichlormid to be amenable to detection by electron capture, nitrogen/phosphorous and electrolytic conductivity detectors. The recovery from lettuce samples fortified at 0.1 ppm was 79.2% with Protocol D and 41.4% with Protocol E. The recovery from soybean samples fortified at 0.1 ppm was 38.3% with Protocol E.

7. Storage Stability Data

Storage stability data were submitted for dichlormid in field corn ears (Accession# 005802). Twenty-five gram samples were fortified with 0.10 ppm of dichlormid. Samples were kept frozen at approximately -20°C ± 10°C for up to three years. Periodic analysis of the samples were completed to determined if dichlormid deteriorated with time during frozen storage. Samples were analyzed at day 0 and after storage for 3, 8, 12, 24, and 36 months. At the 24 and 36 month intervals, newly fortified control samples were also analyzed to verify the accuracy of the analytical procedure. At each interval, 2 fortified samples and 1 unfortified sample were analyzed.

The samples were analyzed for dichlormid using analytical method RRC-83-64, "Determination of Residues of Cycloate, R29148, and R-25788 in Corn Fodder and Corn Grain by Gas Chromatography". The results of this study are presented in Table 12.

Table 12 - Percent recovery of Dichlormid in Corn Ears at Different Time Intervals

Time Interval (days)	Corrected % Recovery[a]
0	93
96	101
240	86
360	99
751	95
1095	73

[a] Each value is the average of 2 individual determinations.

No dichlormid residues, < 0.05 ppm (LOQ), were detected in the control samples.

The study does not specify what different corn RACs were analyzed and uses the term "corn ears". The study does include storage stability data of dichlormid in wheat grain and straw. These data can be translated to corn RACs. Wheat samples were stored at intervals of 270, 818, and 1240 days. The wheat data are presented in Table 13.

Table 13 - Percent recovery of Dichlormid in Wheat RACs at Different Time Intervals

RAC	Time Interval (days)	Corrected % Recovery[a]
Wheat Grain	0	93
	270	88
	818	96
	1240	100
Wheat Straw	0	93
	270	96
	818	96
	1240	87

[a] Each value is the average of 2 individual determinations

The storage stability data are acceptable. The data shows dichlormid to be stable for up to 3 years when stored frozen. HED concludes that storage stability has been demonstrated for the purposes of this action. **If other residues are found to be of regulatory interest, storage stability studies for those residues will be required.**

8. Magnitude of the Residues (Meat, Milk, Poultry, and Eggs)

No feeding studies were submitted. The need for these data will be dependent upon the results of animal metabolism studies.

9. Magnitude of the Residues - Plants

Crop field trial data for dichlormid were previously submitted, reviewed (Memo, W. Chin, 7/2/86; Memo, Coordination Branch, 6/27/72), and found acceptable. These data was submitted in support of an action for the active ingredient (ai) cycloate. The samples in this study were analyzed for cycloate and dichlormid. However, only corn stalks were analyzed. Since no corn RACs (forage, grain, stover) were analyzed, these data will not be used in support of this action.

Crop field trial data for dichlormid were also submitted and reviewed in conjunction with an action for the use of acetochlor on corn (Memo, PP# 5F4505, D214735, G. Herndon, 6/25/96; Memo, ID No. 10182-GOR, D204673, S. Willett, 4/24/95).

Residue data from seven trials conducted in Iowa (Region 5), Illinois (Region 5), Indiana (Region 5), Missouri (Region 5), Nebraska (Region 5), New York (Region 1), and Oregon (Region 11), 1 trial per state, were submitted (MRID No. 43266501). In each field trial, 2 plots were treated pre-plant incorporate (PPI), one with a water dispersible micro-encapsulated granule (WG) containing 59% acetochlor and the other with a dry granular (GR) formulation containing 20% acetochlor. The acetochlor application rate for both was 2.5 lb. a.i./A (1.1 X label rate). Both formulations contained the safener dichlormid at a ratio of acetochlor/dichlormid of 6:1 (i.e. 0.41 lb. dichlormid/acre) (Memo, D204673, S. Willett, 4/24/95) or 0.8x of the proposed maximum application rate of 0.5 lbs dichlormid /A. Samples were analyzed for acetochlor and dichlormid using analytical method no. 244/01, which is not the enforcement method. The limit of detection (LOD) was 0.01 ppm (Memo, D204673, S. Willett, 4/24/95). Table 14 summarizes these data. All field trials has residues < LOD (0.01 ppm).

Table 14 - Residue Levels of Dichlormid from a Pre-Emergent Application of 0.41 lb. dichlormid/A in/on Field Corn RACs

Location	Commodity	Formulation	
		GR (ppm)	WG (ppm)
Iowa	grain	<0.01	<0.01
	forage	<0.01	<0.01
	fodder	<0.01	<0.01
Illinois	grain	<0.01	<0.01
	forage	<0.01	<0.01
	fodder	<0.01	<0.01

Indiana	grain forage fodder	<0.01 <0.01 <0.01	<0.01 <0.01 <0.01
Montana	grain forage fodder	<0.01 <0.01 <0.01	<0.01 <0.01 <0.01
Nebraska	grain forage fodder	<0.01 <0.01 <0.01	<0.01 <0.01 <0.01
New York	grain forage fodder	<0.01 <0.01 <0.01	<0.01 <0.01 <0.01
Oregon	grain forage fodder	<0.01 0.02 <0.01	<0.01 0.02 <0.01

Corn field trial data were submitted and reviewed in support of the post-emergent use (MRID# 43616401) (PP# 5F4505, Memo, D214735, G. Herndon, *et. al.*, 6/25/96) of acetochlor. A formulation, designated Acetochlor EC Herbicide, was used in the field trials. Eight field trials were conducted during the 1993 growing season in IA (Region 5), IL (Region 5), IN (Region 5), MN (Region 5), NE (Region 5), OH (Region 5), TX (Region 8), and WI (Region 5), 1 trial per state. Each treated plot received one post-emergence application of either the emulsifiable concentrate (EC) or microencapsulate (Mcap) formulation when the corn plants had reached a height of 5-9" at an application rate of 3.0 lbs. acetochlor/A. The test substance was mixed with the safener dichlormid (ratio of acetochlor:dichlormid = 6:1). Therefore, the application rate of dichlormid is 0.5 lb. dichlormid/A. For each acetochlor:safener mixture, one plot was treated with the EC formulation and the other was treated with the Mcap formulation.

Table 15 summarizes the data. All field trials had residues below the LOQ (0.01 ppm).

Table 15 - Residue Levels of Dichlormid from a Single Post-Emergence Application of EC or Mcap Formulation in/on Field Corn

Location	Commodity	PHI	Formulation	
			Mcap (ppm)	EC (ppm)
IA	Forage	12-31 DAT	< 0.01	< 0.01
IL			< 0.01	< 0.01
IN			< 0.01	< 0.01
MN			< 0.01	< 0.01
NE			< 0.01	< 0.01
OH			< 0.01	< 0.01
TX			< 0.01	< 0.01
WI			< 0.01	< 0.01
IA	Grain	104-131 DAT	< 0.01	< 0.01
IL			< 0.01	< 0.01
IN			< 0.01	< 0.01
MN			< 0.01	< 0.01
NE			< 0.01	< 0.01
OH			< 0.01	< 0.01

Location	Commodity	PHI	Formulation	
			Mcap (ppm)	EC (ppm)
TX			< 0.01	< 0.01
WI			< 0.01	< 0.01
IA	Stover	104-131 DAT	< 0.01	< 0.01
IL			< 0.01	< 0.01
IN			< 0.01	< 0.01
MN			< 0.01	< 0.01
NE			< 0.01	< 0.01
OH			< 0.01	< 0.01
TX			< 0.01	< 0.01
WI			< 0.01	< 0.01

The reviewed field trials were submitted previous to the current OPPTS Test Guidelines, Series 860. Assuming residues are less than the LOQ, a total of 15 field trials should be conducted on field corn and analyzed for dichlormid in accordance with OPPTS Test Guideline 860.1500.

The registrant has submitted a total of 15 field trials, 7 field trials for pre-emergent use and 8 for post-emergent use. **HED is willing to accept the previous post-emergent data and requires the registrant to submit 8 field trials. Though the Guidelines specifically detail crop field trial data requirements concerning formulations and application type, HED is willing to accept that all 8 field trials be conducted using the microencapsulated formulation and applied post-emergently as the microencapsulate formulation post-emergent use would presumably result in the highest residues. It is recommended that the field trials be conducted as follows: 1 trial in Region 1, 1 trial in Region 2, 5 trials in Region 5, and 1 trial in Region 6. However, if quantifiable residues are found in any samples, then additional field trials will be required.**

Though the submitted field trial data report residue levels <0.01 ppm, the enforcement method's LOQ is 0.05 ppm. Therefore, the appropriate tolerance level is 0.05 ppm for all corn RACs. **If other residues are found to be of regulatory interest, additional field trials will be required.**

10. Processed Food/Feed

No processing studies have been submitted for dichlormid. **The registrant should submit a processed food study in accordance with OPPTS Guideline, 860.1520.**

11. Rotational Crop Restrictions

No rotational crop studies have been submitted for dichlormid. **The registrant should submit a confined rotational crop study in accordance with OPPTS Guideline, 860.1850.**

The least restrictive rotational crop intervals are as follows:

> "ROTATIONAL CROPS: (1) If crop treated with SURPASS EC is lost, field corn, production seed corn, silage corn or popcorn may be replanted immediately. Do not make a

second application of SURPASS EC. (2) Do not rotate to crops other than corn, soybeans, sorghum wheat, or tobacco. Wheat may be planted 4 months after application. Corn, soybeans, sorghum, or tobacco may be planted the spring following application."

Since no rotational crop studies have been submitted for dichlormid, the above label restriction is not appropriate. **A revised Section B should be submitted with a rotation restriction to field, pop, and silage corn only.**

12. Anticipated Residues - Not applicable

13. International Residue Limits

There is neither a Codex proposal, nor Canadian or Mexican limits for residues of **dichlormid** in corn RACs. Therefore, a compatibility issue is not relevant (Attachment 2).

Attachment 1: Dietary Analyses (S. Chun, 8/11/99)
Attachment 2: CODEX Form

cc with Attachments: PP# 6F3344, S. Chun (RAB1), B. Dykstra (RAB1), D. Vogel (RAB1)
RDI: M. Morrow (9/16/99), Team (8/31/99), RAB1 Chemists (9/2/99), Branch (9/8/99)
S. Chun:806R:CM#2:(703)305-2249:7509C:RAB1

Attachment 1: Dietary Analysis (Available electronically)

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

OFFICE OF
PREVENTION, PESTICIDES, AND
TOXIC SUBSTANCES

MEMORANDUM

DATE: August 11, 1999

SUBJECT: Dichlormid - Acute and Chronic (Non-cancer) Dietary Exposure Analyses. Chemical#: 900497. DP Barcode: D258442. Case #: 260310. Submission #: S546651.

FROM/ TO: Susie Chun, Chemist
Registration Action Branch 1
Health Effects Division

THROUGH: Will Donovan, Ph.D. Chemist
Sheila Piper, Chemist
Dietary Exposure Science Advisory Council

Melba Morrow, D.V.M., Branch Senior Scientist
Registration Action Branch 1
Health Effects Division

Action Requested

Provide an estimate of the dietary exposure and associated risks for the safener, dichlormid, *N,N*-diallyl dichloroacetamide, resulting from a request to extend an expired time-limited tolerance of 0.05 ppm in/on corn raw agricultural commodities (RACs) (PP# 6F3344).

Executive Summary

For the acute dietary analysis, an acute population adjusted dose (aPAD) of 0.010 mg/kg/day (incorporating 10x for interspecies extrapolation, 10x for intraspecies variation, and 10x FQPA Safety Factor) was used for the general population, infants, and children. The acute dietary analysis for dichlormid is a conservative estimate of dietary exposure, or Tier 1 assessment, with the use of tolerance level residues and 100 percent crop treated (%CT). The percent aPADs found in this analysis were below HED's level of concern at the 95th percentile for the U.S. population and all subgroups with all exposures ≤ 5% aPAD. HED's level of concern is for exposures >100 % aPAD. The results of this analysis indicate that the estimated acute dietary risk associated with the use of dichlormid in/on corn is below HED's level of concern.

For the chronic dietary analysis, a chronic population adjusted dose (cPAD) of 0.022 mg/kg/day (incorporating 10x for interspecies extrapolation, 10x for intraspecies variation, 3x FIFRA factor, and 10x FQPA Safety Factor) was used. The chronic dietary analysis for dichlormid is a conservative

estimate of dietary exposure, or Tier 1 assessment, with the use of tolerance level residues and 100 %CT. The %cPADs were below HED's level of concern for the U.S. population and all subgroups with all exposures <10% cPAD. HED's level of concern is for exposures >100 % cPAD. The results of this analysis indicates that the estimated chronic dietary risk associated with the use of dichlormid in/on corn RACs is below HED's level of concern.

Toxicological Endpoints

The Hazard Identification Assessment Review Committee (HIARC) met on August 5, 1999 and selected doses and endpoints for dietary and non-dietary exposure risk assessments. The decisions made at the meeting are only for this action (Memo, B. Tarplee, 8/5/99).

FQPA Recommendation

For the purposes of this action, a FQPA Safety Factor (SF) of 10x has been retained for acute and dietary analyses as recommended by HIARC. According to HED policy for expedited actions (i.e., Section 18s, Time-limited tolerances), an FQPA SF of 10x can be retained. If risk estimates do not exceed HED's level of concern under these circumstances, the action can go forward, noting that the safety factor determination applies only to this action and is subject to change when the chemical undergoes full review by the FQPA Safety Factor Committee (SFC).

Since a 10x FQPA SF is retained for acute and chronic dietary analyses, the acute population dose (aPAD) is 0.010 mg/kg/day and chronic population adjusted dose (cPAD) is 0.022 mg/kg/day. The PAD is a modification of the aRfD or cRfD to include the FQPA Safety Factor:

$$acute\ or\ chronic\ PAD = \frac{RfD\ (acute\ or\ chronic)}{FQPA\ SF}$$

Table 1 summarizes the doses and endpoints used for dietary analyses.

Table 1- Toxicological Doses and Endpoints for Dichlormid

EXPOSURE SCENARIO	Dose (mg/kg/day)	ENDPOINT AND TOXICOLOGICAL EFFECT	STUDY
Acute - General Population, including Females 13+, Infants, and Children (Dietary)	Maternal NOAEL = 10.0 UF = 100 FQPA SF = 10	Maternal LOAEL = 40 mg/kg/day based on decreased body weight gain and food consumption (most significant on days 7-10 of dosing).	Developmental toxicity study in rats
	Acute RfD = 0.10 mg/kg/day Acute PAD =0.010 mg/kg/day		
Chronic (Dietary)	NOAEL = 6.5 mg/kg/day UF = 300 FQPA SF = 10	LOAEL = 32.8 mg/kg/day (♂) based on liver clinical pathology/histopathology and increased liver weight Extra 3x due to data gap for the chronic dog study	2-year study in rats
	Chronic RfD = 0.022 mg/kg/day Chronic PAD = 0.0022 mg/kg/day		

Cancer

Dichlormid is not cancer classified, due to no review by the Cancer Assessment Review Committee (CARC). A cancer dietary assessment is not required at this time.

Residue Information

The expired time-limited tolerance expression for dichlormid is in 40 CFR 180.469 at a level of 0.05 ppm for all corn RACs. Dietary Exposure Evaluation Model (DEEM™) default processing factors were used in all analyses. Tolerance level residues and 100% CT were used in both the acute and chronic analyses (Tier 1).

Results

The DEEM™ analysis evaluated the individual food consumption as reported by respondents in the USDA 1989-92 Continuing Surveys for Food Intake by Individuals (CSFII) and accumulated exposure to the chemical for each commodity. Summaries of the residue information used in the acute and chronic (non-cancer) dietary exposure analyses are attached (Attachment 1).

Acute Dietary Exposure Analysis

The acute dietary exposure analysis estimates the distribution of single-day exposures for the U.S. population and certain subgroups and accumulates exposure to the chemical for each commodity. Each analysis assumes uniform distribution of dichlormid for the commodities on which dichlormid is used.

HED's level of concern is for acute dietary exposures greater than 100% aPAD. The acute dietary exposure analysis was performed for the U.S. population and 26 subgroups. Summaries with all population subgroups are attached (Attachment 2).

Acute estimates of the per capita dietary exposures at the 95th percentile are shown in Table 2. For all population subgroups, per capita and per user exposures are essentially equal.

Table 2 - Acute Dietary Exposure Results

Subgroups[1]	aPAD (mg/kg/day)	95th Percentile		99th Percentile		99.9th Percentile	
		Exposure (mg/kg/day)	% aPAD	Exposure (mg/kg/day)	% aPAD	Exposure (mg/kg/day)	% aPAD
U.S. Population.	0.01	0.000200	2	0.000366	4	0.000605	6
All infants (<1 year)	0.01	0.000459	5	0.000682	7	0.001091	11
Nursing infants (< 1 year)	0.01	0.000157	2	0.000266	3	0.000310	3
Non-nursing infants (< 1 year)	0.01	0.000501	5	0.000745	7	0.001134	11
Children (1-6 years old)	0.01	0.000375	4	0.000563	6	0.000799	8
Children (7-12 years old)	0.01	0.000276	3	0.000393	4	0.000578	6
Hispanics	0.01	0.000219	2	0.000429	4	0.000642	6
Non-hispanic blacks	0.01	0.000235	2	0.000421	4	0.000614	6
Females (13-29 yrs/np/nn)	0.01	0.000171	2	0.000230	2	0.000322	3

[1] Population subgroups shown include the U.S. general population, all infants and children subgroups, the highest females 13-50 subgroup, and any other population subgroup whose exposure exceeds that of the U.S. general population at the 95th percentile of exposure.

Chronic Dietary Analysis

The Tier 1 chronic DEEM™ dietary exposure analysis used mean consumption data (3 day average). HED's level of concern is for chronic dietary exposures greater than 100% cPAD. The chronic dietary exposures are summarized in Table 3

Table 3 - Chronic Dietary Exposure Results

Subgroups[1]	Exposure (mg/kg/day)	% cPAD
U.S. Population (48 states)	0.000064	3
All infants (<1 year)	0.000152	7
Nursing infants (< 1 year)	0.000038	2
Non-nursing infants (< 1 year)	0.000200	9
Children (1-6 years old)	0.000149	7
Children (7-12 years old)	0.000114	5
Females (13-19/np/nn)	0.000065	3
Hispanics	0.000068	3
Non-hispanic blacks	0.000074	3
Males (13-19 yrs)	0.000082	4

[1] Population subgroups shown include the U.S. general population, all infants and children subgroups, the highest females 13-50 subgroup, and any other population subgroup whose exposure exceeds that of the U.S. general population.

The complete chronic dietary exposure analysis is attached (Attachment 3).

Conclusions

The acute dietary analysis for dichlormid is a conservative estimate of dietary exposure, or Tier 1 assessment, with the use of tolerance level residues and 100 percent crop treated (%CT). The percent aPADs found in this analysis were below HED's level of concern at the 95th percentile (per capita) for the U.S. population and all subgroups with the highest exposure in non-nursing infants (<1 year) at 5% aPAD. HED's level of concern is for exposures >100 % aPAD. The percent aPADs for users versus per capita are essentially the same. The results of this analysis indicate that the estimated acute dietary risk associated with the use of dichlormid in/on corn is below HED's level of concern.

The chronic dietary analysis for dichlormid is a conservative estimate of dietary exposure, or Tier 1 assessment, with the use of tolerance level residues and 100 %CT. The %cPADs were below HED's level of concern for the U.S. population and all subgroups with with the highest exposure in non-nursing infants at 9% cPAD. HED's level of concern is for exposure >100 % cPAD. The results of this analysis indicates that the estimated chronic dietary risk associated with the use of dichlormid in/on corn RACs is below HED's level of concern.

Attachment 1: Residue Information - Acute and Chronic
Attachment 2: Acute DEEM™ analysis (S. Chun, 8/6/99)
Attachment 3: Chronic DEEM™ analysis (S. Chun, 8/10/99)

cc(with attachments): S. Chun (RAB1); M. Sahafeyan (CEB1), PP# 6F3344
RDI: Dietary Exposure SAC [S. Piper (8/10/99), W. Donovan (8/11/99)]; M. Morrow (//99)
S. Chun:806R:CM#2:(703)305-2249:7509C:RAB1

Attachment 1: Residue Information - Acute and Chronic

Note: The values denoted RfDs are actually the PADs as explained in the Comment Line.

Filename: C:\deem\resdata\900497.r96
Chemical name: Dichlormid
RfD(Chronic): .0022 mg/kg bw/day NOEL(Chronic): 6.5 mg/kg bw/day
RfD(Acute): .01 mg/kg bw/day NOEL(Acute): 10 mg/kg bw/day
Date created/last modified: 08-06-1999/08:23:36/8 Program ver. 6.77
Comment: cPAD- 300 UF, 10x FQPA; aPAD - 100 UF, 10x FQPA

Food Code	Crop Grp	Food Name	RESIDUE (ppm)	RDF #	Adj.Factors #1	#2	Comment
267	15	Corn grain-bran	0.050000	0	1.000	1.000	Extension of TLT, 6F3344
266	15	Corn grain-endosperm	0.050000	0	1.000	1.000	Extension of TLT, 6F3344
289	15	Corn grain-oil	0.050000	0	1.000	1.000	Extension of TLT, 6F3344
268	15	Corn grain/sugar/hfcs	0.050000	0	1.500	1.000	Extension of TLT, 6F3344
388	15	Corn grain/sugar-molasses	0.050000	0	1.500	1.000	Extension of TLT, 6F3344
237	15	Corn/pop	0.050000	0	1.000	1.000	Extension of TLT, 6F3344

Attachment 2: Acute Dietary Exposure Analysis
Note: %aRfD is actually %aPAD.

U.S. Environmental Protection Agency Ver. 6.78
DEEM ACUTE analysis-for DICHLORMID (1989-92 data)
Residue file: 900497.r96 Adjustment factor #2 NOT used.
Analysis Date: 08-06-1999/08:25:42 Residue file dated: 08-06-1999/08:23:36/8
Acute Reference Dose (aRfD) = 0.010000 mg/kg body-wt/day
NOEL (Acute) = 10.000000 mg/kg body-wt/day
Run Comment: cPAD- 300 UF, 10x FQPA; aPAD - 100 UF, 10x FQPA

Summary calculations:

	95th Percentile			99th Percentile			99.9th Percentile	
	Exposure	% aRfD	MOE	Exposure	% aRfD	MOE	Exposure	% aRfD	MOE
U.S. pop - all seasons:	0.000200	2.00	50097	0.000366	3.66.	27356	0.000605	6.05	16518
U.S. pop - spring season:	0.000198	1.98	50408	0.000346	3.46	28880	0.000515	5.15	19422
U.S. pop - summer season:	0.000207	2.07	48258	0.000359	3.59	27845	0.000648	6.48	15441
U.S. pop - autumn season:	0.000203	2.03	49344	0.000398	3.98	25111	0.000677	6.77	14781
U.S. pop - winter season:	0.000186	1.86	53646	0.000325	3.25	30806	0.000535	5.35	18683
Northeast region:	0.000177	1.77	56338	0.000354	3.54	28265	0.000583	5.83	17164
Midwest region:	0.000213	2.13	46981	0.000407	4.07	24580	0.000568	5.68	17613
Southern region:	0.000202	2.02	49580	0.000344	3.44	29082	0.000644	6.44	15533
Western region:	0.000205	2.05	48681	0.000350	3.50	28531	0.000684	6.84	14628
Hispanics:	0.000219	2.19	45700	0.000429	4.29	23316	0.000642	6.42	15566
Non-hispanic whites:	0.000193	1.93	51693	0.000346	3.46	28861	0.000593	5.93	16855
Non-hispanic blacks:	0.000235	2.35	42607	0.000421	4.21	23760	0.000614	6.14	16290
Non-hispanic other:	0.000185	1.85	54074	0.000351	3.51	28515	0.000663	6.63	15094
All infants (<1 year):	0.000459	4.59	21793	0.000682	6.82	14660	0.001091	10.91	9167
Nursing infants (<1 year):	0.000157	1.57	63762	0.000266	2.66	37591	0.000310	3.10	32295
Non-nursing infants (<1 yr):	0.000501	5.01	19977	0.000745	7.45	13419	0.001134	11.34	8821
Children (1-6 years):	0.000375	3.75	26643	0.000563	5.63	17763	0.000799	7.99	12514
Children (7-12 years):	0.000276	2.76	36180	0.000393	3.93	25426	0.000578	5.78	17310

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Acute Dietary contd.

U.S. Environmental Protection Agency ver 6.78
DEEM ACUTE analysis for DICHLORMID (1989-92 data)
Residue file: 900497.r96 Adjustment factor #2 NOT used.
Analysis Date: 08-06-1999/08:25:42 Residue file dated: 08-06-1999/08:23:36/8
Acute Reference Dose (aRfD) = 0.010000 mg/kg body-wt/day
NOEL (Acute) = 10.000000 mg/kg body-wt/day

Summary calculations:

95th Percentile			99th Percentile			99.9th Percentile		
Exposure	aRfD	MOE	Exposure	aRfD	MOE	Exposure	aRfD	MOE
Females (13+/preg/not nsg):								
0.000116	1.16	86034	0.000150	1.50	66644	0.000228	2.28	43903
Females (13+/nursing):								
0.000132	1.32	75518	0.000202	2.02	49493	0.000210	2.10	47604
Females (13-19 yrs/np/nn):								
0.000171	1.71	58416	0.000230	2.30	43434	0.000322	3.22	31011
Females (20+ years/np/nn):								
0.000110	1.10	90600	0.000175	1.75	57221	0.000282	2.82	35464
Females (13-50 years):								
0.000131	1.31	76087	0.000198	1.98	50531	0.000275	2.75	36420
Males (13-19 years):								
0.000195	1.95	51395	0.000343	3.43	29117	0.000475	4.75	21057
Males (20+ years):								
0.000127	1.27	78809	0.000191	1.91	52341	0.000313	3.13	31957
Seniors (55+):								
0.000095	0.95	105172	0.000152	1.52	65905	0.000295	2.95	33852

Attachment 5: Chronic (Non-Cancer) Dietary Exposure Analysis
Note: %RfD is actually %cPAD.

U.S. Environmental Protection Agency Ver. 6.76
DEEM Chronic analysis for DICHLORMID (1989-92 data)
Residue file name: C:\deem\resdata\900497.r96 Adjustment factor #2 NOT used.
Analysis Date 08-10-1999/15:07:44 Residue file dated: 08-10-1999/15:07:14/8
Reference dose (RfD, CHRONIC) = .0022 mg/kg bw/day
COMMENT 1: cPAD- 300 UF, 10x FQPA; aPAD - 100 UF, 10x FQPA

Total exposure by population subgroup

Population Subgroup	Total Exposure mg/kg body wt/day	Total Exposure Percent of Rfd
U.S. Population (total)	0.000064	2.9%
U.S. Population (spring season)	0.000063	2.9%
U.S. Population (summer season)	0.000066	3.0%
U.S. Population (autumn season)	0.000066	3.0%
U.S. Population (winter season)	0.000061	2.8%
Northeast region	0.000058	2.6%
Midwest region	0.000067	3.1%
Southern region	0.000067	3.0%
Western region	0.000062	2.8%
Hispanics	0.000068	3.1%
Non-hispanic whites	0.000062	2.8%
Non-hispanic blacks	0.000074	3.4%
Non-hisp/non-white/non-black)	0.000055	2.5%
All infants (< 1 year)	0.000152	6.9%
Nursing infants	0.000038	1.7%
Non-nursing infants	0.000200	9.1%
Children 1-6 yrs	0.000149	6.8%
Children 7-12 yrs	0.000114	5.2%
Females 13-19(not preg or nursing)	0.000065	3.0%
Females 20+ (not preg or nursing)	0.000040	1.8%
Females 13-50 yrs	0.000047	2.2%
Females 13+ (preg/not nursing)	0.000045	2.0%
Females 13+ (nursing)	0.000048	2.2%
Males 13-19 yrs	0.000082	3.7%
Males 20+ yrs	0.000046	2.1%
Seniors 55+	0.000036	1.6%
Pacific Region	0.000058	2.6%

Attachment 2: Codex Form

013751

INTERNATIONAL RESIDUE LIMIT STATUS

Chemical Name: *N,N*-Diallyl dichloroacetamide	Common Name: Dichlormid	☐ Proposed tolerance ☐ Reevaluated tolerance ☒ Other - Extension of existing time-limited tolerances	Date:7/21/99

Codex Status (Maximum Residue Limits)	U. S. Tolerances
X No Codex proposal step 6 or above ☐ No Codex proposal step 6 or above for the crops requested	Petition Number: 6F3344 DP Barcode: Other Identifier:
Residue definition (step 8/CXL):	Reviewer/Branch: Susie Chun/RAB1
	Residue definition:

Crop (s)	MRL (mg/kg)	Crop(s)	Tolerance (ppm)
		Corn, field, forage	0.05
		Corn, field, grain	0.05
		Corn, field, stover	0.05

Limits for Canada	Limits for Mexico
X No Limits ☐ No Limits for the crops requested	X No Limits ☐ No Limits for the crops requested
Residue definition:	Residue definition:

Crop(s)	MRL (mg/kg)	Crop(s)	MRL (mg/kg)

Notes/Special Instructions:

Rev. 1998

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