

US EPA ARCHIVE DOCUMENT

Dichlormid

Dietary Exposure Assessment

DP Barcode: D321927

PC Code: 900497

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**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**

WASHINGTON, D.C. 20460

**OFFICE OF  
PREVENTION, PESTICIDES  
AND TOXIC SUBSTANCES**

**MEMORANDUM**

DATE: 07/NOV/2005

SUBJECT: **Dichlormid** Acute and Chronic Dietary Exposure Assessment for the Establishment of Permanent Tolerances for the Use of Dichlormid on Corn. Petition Number 4F6950.

PC Code: 900497  
DP Barcode: D321927

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**Executive Summary**

The purpose of this memorandum is to report the results of a dietary exposure analysis for the herbicide/safener dichlormid, N,N-diallyl dichloroacetamide, for use on corn. Products containing dichlormid are conditionally registered in the U.S. to Dow AgroSciences, LLC under the trade names Surpass™ EC, Keystone8™, TopNotch™, Surpass™ 20G, FulTime, Surpass™ 7 E, and Keystone™ LA. Currently, there are time-limited tolerances for its use in the treatment of field corn RACs including corn forage, stover, and grain; sweet corn RACs including corn, forage, stover, and grain; and pop corn RACs including grain and stover.

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### *Acute Dietary Exposure Results and Characterization*

The Tier 1 acute dietary risk assessment for dichlormid shows that for all included commodities, the acute dietary risk estimates are below the Health Effect Division's (HED's) level of concern (i.e. <100% acute population adjusted doses (aPAD)) for the general U.S. population (3.4% of the aPAD) and all population subgroups. The acute dietary risk estimate for the 95<sup>th</sup> percentile of the highest exposed population subgroup, all infants, is 7.5% of the aPAD.

### *Chronic Dietary Exposure Results and Characterization*

The Tier 1 chronic dietary risk assessment for dichlormid shows that for all included commodities, the dietary risk estimates are below HED's level of concern (i.e. <100% chronic population adjusted doses (cPAD)); for the general U.S. population (6.1% of the cPAD) and all population subgroups. The chronic dietary risk estimate for the highest reported exposed population subgroup, children 3-5 years old, is 15% of the cPAD.

### *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. In a feeding/carcinogenicity study in rats there was no evidence of cancer. A cancer dietary assessment is not required.

## **I. Introduction**

### *Dietary Exposure*

Dietary risk assessment incorporates both exposure and toxicity of a given pesticide. For acute and chronic assessments, the risk is expressed as a percentage of a maximum acceptable dose. This is the population adjusted dose (PAD), which HED has concluded will result in no unreasonable adverse health effects. The PAD is the Reference Dose (RfD) divided by the special FQPA Safety Factor. Dietary risk is expressed as a percentage of the PAD. For acute and non-cancer chronic exposures, HED is concerned when estimated dietary risk exceeds 100% of the PAD. References which discuss the acute and chronic risk assessments in more detail are available on the EPA/pesticides web site: "Available Information on Assessing Exposure from Pesticides, A User's Guide", 6/21/2000, web link: <http://www.epa.gov/fedrgstr/EPA-PEST/2000/July/Day-12/6061.pdf>; or see SOP 99.6 (8/20/99).

The most recent dietary risk assessment for dichlormid was conducted by RAB1 (PP# 6F3344, DP Barcode: D258442, S. Chun, 08/11/1999) for an extension of time-limited tolerances for the use on corn.

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## II. Residue Information

In this analysis the acute and chronic dietary exposure and risk estimates resulting from food intake were determined for the general U.S. population and various population subgroups resulting from the addition of corn (field, sweet and pop) RACs to the commodity residue list for dichlormid.

Current tolerances that HED supports for the use of the herbicide safener, dichlormid, are the following:

| Commodity:               | ppm  |
|--------------------------|------|
| Corn, field, forage..... | 0.05 |
| Corn, field, grain.....  | 0.05 |
| Corn, field, stover..... | 0.05 |
| Corn, pop, grain.....    | 0.05 |
| Corn, pop, stover.....   | 0.05 |
| Corn, sweet, forage..... | 0.05 |
| Corn, sweet, grain.....  | 0.05 |
| Corn, sweet, stover..... | 0.05 |

These time-limited tolerances are set to expire at the end of the 2005 calendar year. There are no new tolerances requested in this petition, only the request to convert time-limited tolerances to permanent tolerances.

The DEEM-FCID™ acute and chronic analyses were performed assuming tolerance level residues and that 100% of each crop was treated. Default processing factors were used for all commodities.

This analysis incorporates all current, pending, and proposed tolerances for dichlormid as of September 29, 2005.

## III. DEEM-FCID™ Program and Consumption Information

A dichlormid acute and chronic dietary exposure assessment was conducted using the Dietary Exposure Evaluation Model software with the Food Commodity Intake Database (DEEM-FCID™, Version 2.03), which incorporates consumption data from USDA's Continuing Surveys of Food Intakes by Individuals (CSFII), 1994-1996 and 1998. The 1994-96, 98 data are based on the reported consumption of more than 20,000 individuals over two non-consecutive survey days. Foods "as consumed" (e.g., apple pie) are linked to EPA-defined food commodities (e.g. apples, peeled fruit - cooked; fresh or N/S; baked; or wheat flour - cooked; fresh or N/S, baked) using publicly available recipe translation files developed jointly by USDA/ARS and EPA. Consumption data are averaged for the entire U.S. population and within population subgroups

for chronic exposure assessment, but are retained as individual consumption events for acute exposure assessment.

For acute exposure assessments, individual one-day food consumption data are used on an individual-by-individual basis. The reported consumption amounts of each food item can be multiplied by a residue point estimate and summed to obtain a total daily pesticide exposure for a deterministic (Tier 1 or Tier 2) exposure assessment, or "matched" in multiple random pairings with residue values and then summed in a probabilistic (Tier 3/4) assessment. The resulting distribution of exposures is expressed as a percentage of the aPAD on both a user (i.e., those who reported eating relevant commodities/food forms) and a per-capita (i.e., those who reported eating the relevant commodities as well as those who did not) basis. In accordance with HED policy, per capita exposure and risk are reported for all tiers of analysis. However, for tiers 1 and 2, significant differences in user vs. per capita exposure and risk are identified and noted in the risk assessment.

For chronic exposure and risk assessment, an estimate of the residue level in each food or food-form (e.g., orange or orange juice) on the food commodity residue list is multiplied by the average daily consumption estimate for that food/food form. The resulting residue consumption estimate for each food/food form is summed with the residue consumption estimates for all other food/food forms on the commodity residue list to arrive at the total average estimated exposure. Exposure is expressed in mg/kg body weight/day and as a percent of the cPAD. This procedure is performed for each population subgroup.

#### IV. Toxicological Information

| <b>Exposure Scenario</b>   | <b>Dose (mg/kg/day) and Factors</b>    | <b>End Point and Toxicological Effect</b>   | <b>Study</b>                         |
|--|--|---|--------------------------------------|
| Acute Dietary<br>(General Population including Females 13-50 Infants & Children) | NOAEL = 10<br>UF = 100<br>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<br>aPAD = 0.01 mg/kg/day  |                                      |
| Chronic Dietary  | NOAEL = 5<br>UF = 300<br>FQPA SF = 10  | LOAEL = 20 mg/kg/day based on skeletal muscle fiber degeneration and increased severity and/or incidence of vacuolation of the adrenal cortex.<br><br>Extra 3x UF based on previous dietary risk assessment | Chronic Toxicity Study in Dogs       |

| Table 1. Summary of Toxicology Endpoint Selections for Dichlormid <sup>a</sup> |                              |  |  |
|--|------------------------------|--|--|
| Exposure Scenario  | Dose (mg/kg/day) and Factors | End Point and Toxicological Effect   | Study  |
|  |                              | cRfD = 0.017 mg/kg/day<br>cPAD = 0.0017 mg/kg/day  |  |
| Cancer   | NOAEL = 6.5                  | LOAEL = 32.8 mg/kg/day based on decreased BWG, decreased FE, increased liver weight, and liver histopath.<br>No evidence of carcinogenicity. | Feeding/<br>Carcinogenicity<br>Study in rats |

<sup>a</sup> UF = uncertainty factor; FQPA SF = FQPA safety factor; NOAEL = no observed adverse effect level; LOAEL = lowest observed adverse effect level; PAD = population adjusted dose (a = acute, c = chronic); RfD = reference dose.

Previously, 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). At this time the toxicity database was incomplete - there were data gaps for the 2-generation reproduction study in rats and acute and subchronic neurotoxicity studies. Based on this hazard assessment, with no consideration of the exposure assessments, the HIARC recommended that the **FQPA SF be retained at 10x** for enhanced sensitivity to infants and children since there is qualitative evidence of increased susceptibility in the rabbit developmental study. Although the data gap has since been addressed, metabolism studies are still needed to reassess reducing the FQPA SF.

For chronic dietary exposure only, an additional 3x UF was included in the previous dietary risk assessment due to a data gap for the chronic toxicity study in dogs. Although this study has since been submitted and reviewed, no determination can be made at this time as to the appropriateness of the UF. For purposes of this dietary risk assessment, the additional 3x UF has been included, but, it can be reevaluated at a later date for the next dichlormid action.

## V. Results/Discussion & Conclusions

As stated above, for acute and chronic assessments, HED is concerned when dietary risk exceeds 100% of the PAD. The DEEM-FCID™ analyses estimate the dietary exposure for the U.S. population and various population subgroups for both the acute and chronic dietary exposures. Results are reported in Table 2 for acute dietary exposures for the general U.S. Population, all infants (<1 year old), children 1-2, children 3-5, children 6-12, youth 13-19, females 13-49, adults 20-49, and adults 50+ years. The results reported in Table 3 are for chronic dietary

exposures for the U.S. population and the same 8 population subgroups noted above. A full listing of the residue information used in these analyses is given in Attachments 1 through 4.

### Results of Acute Dietary Exposure Analysis

The Tier 1 acute dietary risk assessment results are reported at the 95<sup>th</sup>, 99<sup>th</sup> and 99.9<sup>th</sup> percentiles. The exposure assessment incorporated 100% CT and tolerance level residue assumptions. The result for the highest exposure group, all infants (7.5% aPAD), at the 95<sup>th</sup> percentile is highlighted in Table 2.

| Population Subgroup     | aPAD (mg/kg/day) | 95 <sup>th</sup> Percentile |        | 99 <sup>th</sup> Percentile |        | 99.9 <sup>th</sup> Percentile |        |
|-------------------------|------------------|-----------------------------|--------|-----------------------------|--------|-------------------------------|--------|
|                         |                  | Exposure (mg/kg/day)        | % aPAD | Exposure (mg/kg/day)        | % aPAD | Exposure (mg/kg/day)          | % aPAD |
| General U.S. Population | 0.010            | 0.000336                    | 3.4    | 0.000577                    | 5.8    | 0.001061                      | 11     |
| All Infants             | 0.010            | 0.000752                    | 7.5    | 0.001400                    | 14     | 0.002113                      | 21     |
| Children 1-2 years old  | 0.010            | 0.000597                    | 6.0    | 0.000956                    | 10     | 0.001925                      | 19     |
| Children 3-5 years old  | 0.010            | 0.000611                    | 6.1    | 0.000886                    | 8.9    | 0.001441                      | 14     |
| Children 6-12 years old | 0.010            | 0.000464                    | 4.6    | 0.000675                    | 6.8    | 0.001102                      | 11     |
| Youth 13-19 years old   | 0.010            | 0.000381                    | 3.8    | 0.000529                    | 5.3    | 0.001141                      | 11     |
| Adults 20-49 years old  | 0.010            | 0.000245                    | 2.5    | 0.000407                    | 4.1    | 0.000658                      | 6.6    |
| Females 13-49 years old | 0.010            | 0.000257                    | 2.6    | 0.000420                    | 4.2    | 0.000709                      | 7.1    |
| Adults 50+ years old    | 0.010            | 0.000148                    | 1.5    | 0.000253                    | 2.5    | 0.000419                      | 4.2    |

### Results of Chronic Dietary Exposure Analysis

A Tier 1 chronic dietary risk assessment was conducted for dichlormid food uses. The exposure assessment incorporated 100% CT and tolerance level residue assumptions. For all commodities,

the chronic risk estimates are below the Agency's level of concern for the general U.S. population (6.1% of the cPAD) and all infants (<1 year old), children 1-2, children 3-5, children 6-12, youth 13-19, females 13-49, adults 20-49, and adults 50+ years. The chronic dietary exposure estimate for the highest exposed population subgroup, children 3-5 years old, is 15% of the cPAD.

| <b>Table 3. Results of Chronic Dietary Exposure Analysis</b> |                             |                                 |               |
|--|-----------------------------|---------------------------------|---------------|
| <b>Population Subgroup</b>                                   | <b>cPAD<br/>(mg/kg/day)</b> | <b>Exposure<br/>(mg/kg/day)</b> | <b>% cPAD</b> |
| General U.S. Population                                      | 0.0017                      | 0.000104                        | 6.1           |
| All Infants (< 1 year old)                                   | 0.0017                      | 0.000138                        | 8.1           |
| Children 1-2 years old                                       | 0.0017                      | 0.000213                        | 13            |
| Children 3-5 years old                                       | 0.0017                      | 0.000246                        | <b>15</b>     |
| Children 6-12 years old                                      | 0.0017                      | 0.000188                        | 11            |
| Youth 13-19 years old  | 0.0017                      | 0.000142                        | 8.4           |
| Adults 20-49 years old                                       | 0.0017                      | 0.000085                        | 5.0           |
| Females 13-49 years old                                      | 0.0017                      | 0.000085                        | 5.0           |
| Adults 50+ years old   | 0.0017                      | 0.000049                        | 2.9           |

## **VI. List of Attachments**

Attachment 1- Results of Tier 1 Acute Dietary Analysis of Dichlormid

Attachment 2- Residue Inputs for Tier 1 Acute and Tier 2 Chronic Dietary Assessments of Dichlormid

Attachment 3- Results of Tier 2 Chronic Dietary Analysis for Dichlormid



Attachment 1- Results of Tier 1 Acute Dietary Analysis of Dichlormid

U.S. Environmental Protection Agency Ver. 2.02  
 DEEM-FCID ACUTE Analysis for DICHLORMID (1994-98 data)  
 Residue file: 900497a.R98 Adjustment factor #2 NOT used.  
 Analysis Date: 09-27-2005/17:48:47 Residue file dated: 09-27-2005/17:44:21/8  
 NOEL (Acute) = 10.000000 mg/kg body-wt/day  
 Daily totals for food and foodform consumption used.  
 Run Comment: ""

Summary calculations (per capita):

|                    | 95th Percentile |        |       | 99th Percentile |        |       | 99.9th Percentile |        |       |
|--------------------|-----------------|--------|-------|-----------------|--------|-------|-------------------|--------|-------|
|                    | Exposure        | % aRfD | MOE   | Exposure        | % aRfD | MOE   | Exposure          | % aRfD | MOE   |
| U.S. Population:   | 0.000336        | 3.36   | 29760 | 0.000577        | 5.77   | 17317 | 0.001061          | 10.61  | 9426  |
| All infants:       | 0.000752        | 7.52   | 13294 | 0.001400        | 14.00  | 7140  | 0.002113          | 21.13  | 4732  |
| Children 1-2 yrs:  | 0.000597        | 5.97   | 16737 | 0.000956        | 9.56   | 10456 | 0.001925          | 19.25  | 5195  |
| Children 3-5 yrs:  | 0.000611        | 6.11   | 16373 | 0.000886        | 8.86   | 11284 | 0.001441          | 14.41  | 6937  |
| Children 6-12 yrs: | 0.000464        | 4.64   | 21567 | 0.000675        | 6.75   | 14816 | 0.001102          | 11.02  | 9071  |
| Youth 13-19 yrs:   | 0.000381        | 3.81   | 26220 | 0.000529        | 5.29   | 18893 | 0.001141          | 11.41  | 8762  |
| Adults 20-49 yrs:  | 0.000245        | 2.45   | 40778 | 0.000407        | 4.07   | 24570 | 0.000658          | 6.58   | 15197 |
| Adults 50+ yrs:    | 0.000148        | 1.48   | 67790 | 0.000253        | 2.53   | 39495 | 0.000419          | 4.19   | 23871 |
| Females 13-49 yrs: | 0.000257        | 2.57   | 38853 | 0.000420        | 4.20   | 23837 | 0.000709          | 7.09   | 14113 |

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## Attachment 2- Residue Inputs for Tier 1 Acute and Tier 2 Chronic Dietary Assessments of Dichlormid

U.S. Environmental Protection Agency

Ver. 2.02

DEEM-FCID Acute analysis for DICHLORMID

Residue file name: C:\My Documents\Breann's Work\ARIA\Dichlormid\900497a.R98

Analysis Date 09-27-2005

Residue file dated: 09-27-2005/17:44:21/8

Reference dose: aRfD = 0.01 mg/kg bw/day NOEL = 10 mg/kg bw/day

| EPA Code | Crop Grp | Food Name                    | Def Res (ppm) | Adj. Factors |       |
|----------|----------|------------------------------|---------------|--------------|-------|
|          |          |                              |               | #1           | #2    |
| 15001200 | 15       | Corn, field, flour           | 0.050000      | 1.000        | 1.000 |
| 15001201 | 15       | Corn, field, flour-babyfood  | 0.050000      | 1.000        | 1.000 |
| 15001210 | 15       | Corn, field, meal            | 0.050000      | 1.000        | 1.000 |
| 15001211 | 15       | Corn, field, meal-babyfood   | 0.050000      | 1.000        | 1.000 |
| 15001220 | 15       | Corn, field, bran            | 0.050000      | 1.000        | 1.000 |
| 15001230 | 15       | Corn, field, starch          | 0.050000      | 1.000        | 1.000 |
| 15001231 | 15       | Corn, field, starch-babyfood | 0.050000      | 1.000        | 1.000 |
| 15001240 | 15       | Corn, field, syrup           | 0.050000      | 1.500        | 1.000 |
| 15001241 | 15       | Corn, field, syrup-babyfood  | 0.050000      | 1.500        | 1.000 |
| 15001250 | 15       | Corn, field, oil             | 0.050000      | 1.000        | 1.000 |
| 15001251 | 15       | Corn, field, oil-babyfood    | 0.050000      | 1.000        | 1.000 |
| 15001260 | 15       | Corn, pop                    | 0.050000      | 1.000        | 1.000 |
| 15001270 | 15       | Corn, sweet                  | 0.050000      | 1.000        | 1.000 |
| 15001271 | 15       | Corn, sweet-babyfood         | 0.050000      | 1.000        | 1.000 |

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### Attachment 3- Results of Tier 2 Chronic Dietary Analysis for Dichlormid

U.S. Environmental Protection Agency Ver. 2.00  
 DEEM-FCID Chronic analysis for DICHLORMID (1994-98 data)  
 Residue file name: C:\My Documents\Breann's Work\ARIA\Dichlormid\900497c.R98  
 Adjustment factor #2 NOT used.  
 Analysis Date 10-03-2005/12:01:17 Residue file dated: 10-03-2005/12:00:16/8  
 Reference dose (RfD, Chronic) = .0017 mg/kg bw/day

=====  
 Total exposure by population subgroup  
 =====

| Population Subgroup                 | Total Exposure    |                |
|-------------------------------------|-------------------|----------------|
|                                     | mg/kg body wt/day | Percent of Rfd |
| U.S. Population (total)             | 0.000104          | 6.1%           |
| U.S. Population (spring season)     | 0.000106          | 6.2%           |
| U.S. Population (summer season)     | 0.000113          | 6.6%           |
| U.S. Population (autumn season)     | 0.000100          | 5.9%           |
| U.S. Population (winter season)     | 0.000099          | 5.8%           |
| Northeast region                    | 0.000091          | 5.4%           |
| Midwest region                      | 0.000114          | 6.7%           |
| Southern region                     | 0.000106          | 6.2%           |
| Western region                      | 0.000104          | 6.1%           |
| Hispanics                           | 0.000119          | 7.0%           |
| Non-hispanic whites                 | 0.000101          | 5.9%           |
| Non-hispanic blacks                 | 0.000117          | 6.9%           |
| Non-hisp/non-white/non-black        | 0.000088          | 5.2%           |
| All infants (< 1 year)              | 0.000138          | 8.1%           |
| Nursing infants                     | 0.000040          | 2.4%           |
| Non-nursing infants                 | 0.000175          | 10.3%          |
| Children 1-6 yrs                    | 0.000231          | 13.6%          |
| Children 7-12 yrs                   | 0.000182          | 10.7%          |
| Females 13-19 (not preg or nursing) | 0.000122          | 7.2%           |
| Females 20+ (not preg or nursing)   | 0.000064          | 3.8%           |
| Females 13-50 yrs                   | 0.000091          | 5.3%           |
| Females 13+ (preg/not nursing)      | 0.000082          | 4.8%           |
| Females 13+ (nursing)               | 0.000075          | 4.4%           |
| Males 13-19 yrs                     | 0.000162          | 9.5%           |
| Males 20+ yrs                       | 0.000079          | 4.7%           |
| Seniors 55+                         | 0.000047          | 2.7%           |
| Children 1-2 yrs                    | 0.000213          | 12.5%          |
| Children 3-5 yrs                    | 0.000246          | 14.5%          |
| Children 6-12 yrs                   | 0.000188          | 11.0%          |
| Youth 13-19 yrs                     | 0.000142          | 8.4%           |
| Adults 20-49 yrs                    | 0.000085          | 5.0%           |
| Adults 50+ yrs                      | 0.000049          | 2.9%           |
| Females 13-49 yrs                   | 0.000085          | 5.0%           |



13544



R118472

**Chemical:** Acetamide, 2,2-dichloro-N,N-di-2-propenyl-

**PC Code:**  
900497

**HED File Code:** 51100 RD Chemistry Reviews

**Memo Date:** 11/7/2005

**File ID:**

**Accession #:** 412-06-0009

**HED Records Reference Center**  
2/21/2006

