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

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United States Environmental Protection Agency **Office of Pesticide Programs**

MEMORANDUM

SUBJECT: **Occupational and Residential Exposure Assessment for Carboquat WP-50 (DIDECYL DIMETHYL AMMONIUM CARBONATE/BICARBONATE)**

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DP Barcode (s): **D303714 and D303938**

Pesticide Chemical No.: **069208**

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EXECUTIVE SUMMARY

In this document, the occupational exposures for use of Carboquat WP-50 (active ingredient: Didecyl Dimethyl Ammonium Carbonate/bicarbonate (DDA Carbonate)) as a biocide on indoor structural wood, particle board, oriented strand board, sheathing, insulation and drywall are assessed. The short-, intermediate-, and long-term dermal NOAEL for DDA Carbonate is 12 mg/kg/day, based on increased clinical and gross findings. Since no inhalation studies were available, HIARC selected the oral NOAEL for the inhalation endpoint. In this case, the inhalation exposure component was converted to an equivalent oral dose (mg/kg/day) using a 100% (default) absorption rate and application rate. The converted oral dose was then compared to the oral NOAEL of 10 mg/kg/day for short-, intermediate- and chronic-term oral exposure to calculate the MOEs. An uncertainty factor or “target” margin of exposure (MOE) of 100 was selected for the dermal and inhalation risk assessment, based on 10x for differences among humans (intra species variability) and 10x for differences between the test animals and humans (inter species extrapolation).

As very little chemical specific data were available regarding typical exposures to DDA Carbonate, surrogate data were used to estimate exposure risks. Inhalation and dermal exposures were addressed for occupational populations using surrogate data from the Chemical Manufacturers Association (CMA, 1992), a study review on the *Measurement and Assessment of Dermal and Inhalation Exposures to Didecyl Dimethyl Ammonium Chloride (DDAC) Used in the Protection of Cut Lumber (Phase III)* (Bestari et al., 1999), and other assumptions that are consistent with those used in a CCA study. The DDA Chloride study, in particular, was relied on to estimate DDA Carbonate exposures. In the DDA Chloride study, volunteers from saw mills in Canada were monitored for dermal and inhalation exposure to DDA Chloride. In using data from this study, it was assumed that DDA Chloride and DDA Carbonate end products will be used in similar quantities, and a modification factor can be used to account for the varying percentages of active ingredients (50% DDA Carbonate/80% DDA Chloride), and the procedures for applying both chemicals are similar, and the physical-chemical properties that affect the transport of the chemical are similar.

The calculations of exposures and MOEs are shown in Tables 5, 6, and 7. Two of the six occupational dermal exposures assessed have calculated MOEs that are less than the target MOE (Target MOE = 100) and are therefore of concern to the Agency. The scenarios for which dermal MOEs are of concern are: liquid pump (MOE=88) and clean-up (MOE=24). All calculated inhalation doses were above the target MOE (100).

1.0 Background

Purpose

This document presents the results of the Agency’s review of the potential human health effects of exposure to Didecyl Dimethyl Ammonium Carbonate/bicarbonate (DDA Carbonate). This document is for use in the Agency’s development of Re-registration Eligibility Decision Document (RED) for didecyl dimethyl ammonium carbonate and bicarbonate.

Criteria for Conducting Exposure Assessments

An occupational and/or residential exposure risk assessment is required for an active ingredient if (1) certain toxicological criteria are triggered and (2) there is potential exposure to handlers (mixers, loaders, applicators, etc.) during use or to persons entering treated sites after application. For this chemical, both criteria were met.

1.1 Summary of Toxicity Concerns Relating to Exposures

Table 1 presents the acute toxicity categories as outlined in Report of the Hazard Identification Assessment Review Committee (HIARC) for Didecyl Dimethyl Ammonium Carbonate (EPA, 2000). DDA Chloride's toxicity endpoints were used as surrogate endpoints for DDA Carbonate, due to the toxicity similarities between the two chemicals. The PAN pesticide database lists didecyl dimethyl ammonium carbonate as the parent compound in the quaternary ammonium compounds class, and didecyl dimethyl ammonium chloride as a group 1 compound under the same class, thus justifying the use of surrogate data. DDA Chloride has moderate acute toxicity by the oral route($LD_{50\ (combined)}$= 262 mg/kg, Category II) and low acute toxicity by the dermal route ($LD_{50\ (combined)}$ = 2930 mg/kg, Category III). DDA Chloride is a corrosive irritant to the eyes and skin (Category I). Slight skin sensitization has also been observed (EPA, 2000).

Table 1. Acute Toxicity of DDAC

Study Type	Results	Toxicity Category
Acute Oral	$LD_{50\ (combined)}$ = 262 mg/kg	II
Acute Dermal	$LD_{50\ (combined)}$ = 2930 mg/kg	III
Acute Inhalation	LC_{50} = between 0 - 0.7 mg/L	II
Primary Eye Irritation	Corrosive Irritant	I
Primary Skin Irritation	Corrosive Irritant	I
Dermal Sensitization	Slight Sensitization	-

<u>Toxicological Endpoints</u>

The endpoints used in this document to assess the occupational/residential risks of DDA Carbonate are short-, intermediate-, and long-term dermal NOAELs and short-, intermediate, and long-term inhalation endpoints based on oral studies. The short-, intermediate-, and long-term dermal NOAEL is 12 mg/kg/day, based on clinical and gross findings in a 90-day dermal rat study. Since no inhalation studies were available, HIARC selected the oral NOAEL for inhalation risk assessment. The inhalation exposure component was converted to an equivalent oral dose (mg/kg/day) using a 100% (default) absorption rate and application rate. The converted oral dose was then compared to the oral NOAEL of 10 mg/kg/day for short-, intermediate- and chronic-term oral exposure to calculate the inhalation MOEs.

HIARC selected a target MOE of 100 for short-, intermediate-, and long-term dermal and inhalation risk assessments (EPA, 2000). The toxicological endpoints used in this assessment are presented in Table 2.

FQPA Considerations

Based on available data, HIARC concluded there is no evidence DDA Chloride will induce neurotoxic effects. In addition, there is no quantitative or qualitative evidence of increased susceptibility to rat or rabbit fetuses following in utero exposure in the prenatal developmental toxicity studies or in the offspring when exposed to adults in the two-generation reproductive study. HIARC concluded that the evidence does not support the need for a developmental neurotoxicity study.

Table 2. Acute Toxicological Endpoints

Exposure Scenario	Dose Used in Risk Assessment	Target Margin of Exposure (MOE)	Study and Toxicological Effects
Short-Term, Intermediate-Term and Long-Term Dermal	NOAEL= 12 mg/kg/day	**Target MOE** = 100 (Residential and occupational)	Rat 90-day Dermal Study (MRID 413059) Based on increased dermal clinical and gross findings
Short-, Intermediate- and Long-Term Inhalation	NOAEL* = 10 mg/kg/day	**Target MOE** = 100 (Residential and occupational)	Chronic Dog Study (MRID 419704-01) Based on decreased total cholesterol levels in females.

* Based on a NOAEL from an oral study (assuming 100% inhalation absorption).

1.2 Summary of Use Patterns and Formulations

Table 3 lists the active EPA registration number of the product containing DDA Carbonate evaluated in this report. DDA Carbonate is a biocide used to protect wood articles from fungi, mold, and mildew. Only one product containing DDA Carbonate is currently registered for antimicrobial use: Carboquat WP-50.

The scenarios considered in this risk assessment are shown in Table 4. These scenarios were selected based on product labels and EPA guidance.

Table 3. EPA Registration Numbers for DDA Carbonate Products

Use Category	Formulation	EPA Registration Numbers
Wood Preservative Biocide	Soluble concentrate	6836-304

Table 4. Use scenarios for DDA Carbonate

Use Site Category	Scenario
Industrial premises and equipment	· Closed-liquid pumping of wood preservative into blender/spray · Chemical operator for spray box system · Grading of dry lumber, looking for defects by hand · Cutting dry wood using a trim saw · Repairing conveyer belts & general maintenance to keep mill in operating order · General cleanup of mill facilities
Commercial and institutional premises	· Cutting dry wood using a trim saw · Installation of plywood, oriented strand board, medium density fiberboard, and others

Formulation Types and Percent Active Ingredient

The product label states that wood preservative products should be formulated to provide retention of up to 0.05 to 0.2 lb/ft^3 of DDA Carbonate when used in pressure treatment systems, and 0.05% - 0.5% w/w when used as a surface coat in blender systems for composite wood products. Carboquat WP-50 contains 50.0% of the carbonate/bicarbonate ammonium as ingredients. Carboquat WP-50 is a concentrate used as a wood preservative (biocide against fungi, mold, and mildew).

2.0 Primary Occupational Handler Exposures

Six primary handler scenarios for industrial premises are considered in this assessment:

- Closed-liquid pumping of wood preservative into blender/spray
- Chemical operator for spray box system
- Grading of wet lumber, looking for defects by hand
- Cutting of dry wood using a trim saw
- Repairing conveyer belts & general maintenance to keep mill in operating order
- General cleanup of mill facilities

The daily dermal and inhalation dose exposures for handlers in the open and closed system were calculated using the following formula:

$$\text{Daily Dose (mg a.i./kg bw/day)} = \frac{\text{(Unit Exp. mg/lb a.i.)} \times \text{(lbs a.i./gal. prod.)} \times \text{(gal. prod. /day)}}{\text{Body weight}} \quad \text{(Eq.1)}$$

The daily inhalation and dermal dose exposures for chemical operators were calculated using the following formula:

$$\text{Daily Dose (mg a.i./kg bw/day)} = \frac{\text{(Unit Exposure mg/day)}}{BW} \quad \text{(Eq. 2)}$$

Short-, intermediate-, and long-term inhalation and dermal margins of exposures for occupational handlers were calculated using the following formula:

$$MOE = \frac{NOAEL}{Dose} \qquad \text{(Eq.3)}$$

Because chemical-specific data were largely unavailable, inhalation and dermal exposures were estimated for occupational populations using surrogate data from the Chemical Manufacturers Association (CMA, 1992) and a study of the occupational exposure associated with DDA Chloride, which is another wood preservative used in a similar manner (Bestari et al., 1999).

In the CMA study, dermal and inhalation exposures were measured for workers performing operations typically associated with antimicrobial use in industrial settings. Nine different low-volatility pesticide active ingredients, formulated in a variety of types (liquid, powder, etc.) were applied using a variety of methods. Although the types of activities performed in this study closely match some of the scenarios being considered in this assessment, the confidence that can be placed in these data are low because good laboratory practices were not followed closely and because the number of replicates used for each type of activity studied was low.

DDA Chloride is a chemical used as a preservative for cut lumber. The DDA Chloride study examined individuals working with antisapstains while performing routine tasks at 11 sawmills/planar mills. Dermal and inhalation exposure monitoring data were gathered for each job function of interest using dosimeters and personal sampling tubes. Dosimeters and personal air sampling tubes were analyzed for DDA Chloride, and the results were reported in terms of mg DDA Chloride exposure per person per day. The study reported average daily exposures for workers in various categories. Job specific unit doses were pulled from the data used to obtain the averages and used to obtain an job specific average. The three stratus used to obtain both inhalation and dermal unit exposures contained a total of 20 workers in the wet strata, 30 workers in the maintenance strata, and 20 workers in the dry strata. Trim saw worker unit exposures were drawn and averaged from the dry strata (2 out of 20), grader worker unit exposures were drawn form the wet strata (13 out of 20). Chemical operators (11 out of 30), millwrights (3 out of 30) and clean up staff (6 out of 30) were drawn and each averaged from the maintenance strata. Appendix A presents the DDAC inhalation and dermal exposure data used in this assessment.

Using surrogate unit exposure data, application rates from labels and calculated dose levels from lumber mill workers, primary dermal and inhalation occupational handler exposure assessments were conducted.

The following assumptions were used when calculating application rates for liquid pump/pour:

- Wood preservative may be poured into batches to treat wood composite materials, using liquid closed pumping methods. In a closed pumping system, a handler may come into contact with DDA Carbonate through ventilation exhausts or chutes. CMA data for unit exposures associated with these workers were used.

- Wood slurry is treated in batches in a 10,000 gallon tank, and eight batches of wood slurry are treated per day (one per hour for an 8-hr work shift). Each batch requires 3,000 gallons of preservatives, and it has been assumed that the wood slurry fills up the remainder of the volume of the tank (7,000 gallons of wood slurry per batch). The total amount of wood slurry would therefore be: 7,000 gallons per batch × 8 batches per day, totaling 56,000 gallons of wood slurry

($213\ m^3$). The assumptions used for batch sizes and the quantity of preservative needed are consistent with an assessment performed previously by the EPA.

- The label states that, for non-pressure treatment in blender systems, the treated wood should be up to 0.5% active ingredient by weight (7.16 lb a.i./m^3, assuming that wood has a density of 650 kg/m^3 (Austral Plywoods, 2004)).

The following assumptions for calculating dermal/inhalation doses for chemical operators, graders, mill wrights, and clean-up staff were used:

- The chemical operators at a DDA Carbonate facility are equivalent to the chemical operators monitored in the DDA Chloride study. In the DDA Chloride study, chemical operators consisted of chemical operators, chemical assistants, chemical supervisors, and chemical captains. They maintained chemical supply balance and flushes and cleaned spray nozzle.

- The graders at a DDA Carbonate facility are equivalent to the graders monitored in the DDA Chloride study. In the DDA Chloride study, graders were positioned first after the spray box and graded (or detected faults in) wet lumber by hand. With DDA Carbonate, graders grade dry lumber; therefore, the exposures to graders using DDA Carbonate are worst-case scenarios.

- The trim saw operators at a DDA Carbonate facility are equivalent to the hula trim saw operators monitored in the DDA Chloride study. In the DDA Chloride study, trim saw operators operated the hula trim saw and consisted of operators and strappers.

- The millwright at a DDA Carbonate facility is equivalent to the millwrights monitored in the DDA Chloride study. In the DDA Chloride study, millwrights repaired all conveyer chains and general up-keep of the mill.

- The clean-up crews at a DDA Carbonate facility are equivalent to the clean-up crews monitored in the DDA Chloride study. In the DDA Chloride study, the clean-up crews performed general cleaning duties at the mill.

- The value for non-detects used in all inhalation exposure calculations was assumed to be half the detection limit of inhalation exposures to diptank operators (LOD = 0.0056 µg), due to the lack of information regarding detection limits for inhalation meters for other types operations. The limit of detection for dermal exposures was 0.0056 mg.

- In the DDA Chloride study, dermal exposures to hands were measured separately from the rest of the body. For each replicate the body dose measurements and hand dose measurements were added for a total dermal dose. None of the body dose measurements or hand dose measurements were below the detection limit (0.0056 mg). Calculation of the average dermal and inhalation exposures are presented in Appendix A.

- In using the DDA Chloride study, it was assumed that the quantities of DDA Chloride and DDA Carbonate end-products used are similar, and that workers at DDA Chloride and DDA Carbonate facilities perform similar tasks. A conversion factor was used to account for the fact that the DDA Carbonate product and the DDA Chloride product have different concentrations of their respective active ingredients. The use of this conversion factor is shown in Appendix A.

The calculations of exposures and MOEs are shown in Tables 5, 6, and 7. Two of the six occupational dermal exposures assessed have calculated MOEs that are less than the target MOE (Target MOE = 100) and are therefore of concern to the Agency. **The scenarios for which dermal MOEs are of concern are: liquid pump (MOE=88) and clean-up (MOE=24). All calculated inhalation doses were above the target MOE (100).**

Table 5. Short-, Intermediate-, and Long-Term Primary Handler Exposure and Risks for DDA Carbonate									
Exposure Scenario	**Clothing and PPE**	**Dermal Unit Exposure[1] (mg/lb a.i.)**	**Inhalation Unit Exposure[1] (mg/lb a.i.)**	**Application rate[2] (lb a.i./m^3)**	**Daily Amount Treated[3] (cubic meters)**	**Daily Short-,Intermediate-, and Long-Term Dermal Dose[4] (mg/kg/day)**	**Daily Short-,Intermediate-, and Long-Term Inhalation Dose[4] (mg/kg/day)**	**Short-,Intermediate-, and Long-Term Dermal MOE[5]**	**Short-,Intermediate-, and Long-Term Inhalation MOE[5]**
Liquid Pump	Long-sleeved shirts, cotton work trousers, and gloves	0.00629	0.000403	7.16	213	0.137	0.00878	**88.00**	1100

1. Dermal and inhalation unit exposures are from CMA study (USEPA 1999).
2. Application rate based on product label instruction.
3. Daily amount treated comes from the assumptions similar to those presented in the CCA study.
4. Dermal/Inhalation dose (mg/kg/day) = [dermal/ inhalation unit exposure * max appl. rate * amount treated / body weight (70 kg)].
5. MOE = NOAEL (mg/kg/day) [short-, intermediate-, and long term dermal NOAEL = 12.0 mg/kg/day and inhalation NOAEL = 10 mg/kg/day] / Daily Dose. Target MOE is 100.

Table 6. Calculation of Inhalation Unit Exposures			
Exposure Scenario	**Air Concentration[1,4] (µg/m^3)**	**Inhalation Rate[2] (m^3/hr)**	**Inhalation Exposure[3] (mg/day)**
Chemical Operator	0.575	2.45	0.0113
Grader	0.636	2.45	0.0125
Trim Saw	3.84	2.45	0.0754
Millwright	3.25	2.45	0.0637
Clean Up	46.1	2.45	0.903

1. Air concentrations were obtained from the review of study MRID 455243-01 (Bestari et al, 1999). See Appendix A.
2. Inhalation rate was obtained from Exposure Factors Handbook (USEPA, 1997).
3. Inhalation exposure = (Air concentration * Inhalation rate) * Conversion factor (1/1000) * 8 hours working per day.
4. The limit of detection for diptank operators was assumed to apply to all application methods (spray box). The limit was 0.0056 µg and was converted to µg/ m3 (µg/ m3 = 0.0056 µg/(average flow rate per volunteer (L/min)*time of sampling (480 min)) * 1000 L/m3. Data was obtained from Bestari et al., 1999.

Table 7. Short-, Intermediate, and Long-Term Secondary Exposure and Risks for DDA Carbonate Use at Commercial and Institutional Facilities								
Exposure Scenario	Number of Volunteers[1]	Clothing and PPE	Dermal[2] Exposure (mg)	Inhalation[2] Exposure (mg)	Daily Dermal Dose[3] (mg/kg/day)	Daily Inhalation Dose[3] (mg/kg/day)	Short-, Intermediate-, and Long-term Dermal MOE[4]	Short-, Intermediate-, and Long-term Inhalation MOE[4]
Chemical Operator	11	short sleeve shirts, cotton work trousers, and cotton glove dosimeter gloves under chemical resistant gloves	6.13	0.0113	0.0876	1.61×10^{-4}	140	62,000
Grader	13		1.96	0.0125	0.0279	1.78×10^{-4}	430	56,000
Trim Saw	2		0.863	0.0754	0.0123	1.077×10^{-3}	970	9,300
Millwright	3		8.00	0.0637	0.114	9.10×10^{-4}	110	11,000
Clean Up	6		34.6	0.903	0.494	0.0133	**24**	780

1. Volunteers were group according to tasks they conducted at the mill.
2. See Appendix A for calculation of dermal and inhalation exposures.
3. Dermal/Inhalation dose (mg/kg/day) = exposure (mg) (see Table A)/body weight (70 kg).
4. MOE = NOAEL (mg/kg/day) / Daily Dose [Short-, intermediate-, and long-term dermal NOAEL = 12.0 mg/kg/day and short-, intermediate-, and long-term inhalation NOAEL = 10 mg/kg/day]. Target MOE is 100.

3.0 Commercial and Institutional Premises and Equipment

For commercial and institutional equipment, the following secondary exposure scenarios have been considered for this assessment:

- Cutting dry wood using a trim saw
- Installation of plywood, oriented strand board, medium density fiberboard, and others

The commercial trim saw scenario is identical to the industrial trim saw scenario described in Section 2.0. Inhalation and dermal exposures to the trim saw operator was calculated using surrogate data primarily from Bestari et al. (1999). The rationale for using the data and the assumptions necessary to use these data are addressed in section 2.0. The calculations used in obtaining the dermal and inhalation exposures and MOEs are also presented in Section 2.0. The dermal MOE for a trim saw worker (MOE = 970) is above the dermal MOE of concern (target MOE = 100). The inhalation MOE for a trim saw worker (MOE = 9,300) was above the inhalation MOE of concern (target MOE = 100).

Not enough data exist to estimate the amount of exposure associated with construction workers who install treated wood. In particular, values for the transfer coefficient associated with a construction worker handling the wood, the thickness of the treatment layer on wood (for wood treated using spray methods), and the extent to which the chemical may have the potential to migrate out of the wood (for wood treated using blender-type methods) could not be determined. However, it is believed that the construction worker using a trim saw will have larger dermal and inhalation exposures than the installer, due to the amount of sawdust generated and the greater amount of hand contact that would be necessary to handle the wood when using a saw compared to installing the wood.

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Appendix A: DDAC Dermal and Inhalation Exposure Data

Table A1: Excel Calculations and Data Table for DDA Chloride Exposures

	Chemical Op mg Dermal	Chemical Op µg/m³ Inhalation	Grader mg Dermal	Grader µg/m³ Inhalation	Trim Saw mg Dermal	Trim Saw µg/m³ Inhalation	Millwright mg Dermal	Millwright µg/m³ Inhalation	Cleanup Crew mg Dermal	Cleanup crew µg/m³ Inhalation
	3.5	10.1	3.05	0.002899	0.78	0.002834	1.31	0.002917	68.26	0.002991
	6.11	0.002795	7.47	0.002928	1.98	12.3	29.08	0.00283	0.72	0.002788
	6.07	0.00279	1.09	0.002911			8.03	15.6	165.99	30.3
	46.37	0.002823	10.51	0.003004					95.22	412
	0.94	0.002934	0.61	0.002821					1.2	0.002836
	22.15	0.002833	0.98	0.002848					0.26	0.00281
	21.45	0.002774	2.63	0.002911						
	0.22	0.002726	5.23	0.002848						
	0.44	0.002774	0.19	13.2						
	0.33	0.003141	1.47	0.002891						
	0.29	0.002881	2.38	0.002852						
			4.09	0.002813						
			1.03	0.002943						
Average	**9.806364**	**0.92077**	**3.133077**	**1.018051**	**1.38**	**6.151417**	**12.80667**	**5.201916**	**55.275**	**73.71857**
min	0.22	0.002726	0.19	0.002813	0.78	0.002834	1.31	0.00283	0.26	0.002788
max	46.37	10.1	10.51	13.2	1.98	12.3	29.08	15.6	165.99	412

Dermal exposures and measurable inhalation exposures were obtained directly from Bestari et al. (1999). Volunteers who were not exposed to measurable quantities of DDAC were assumed to have been exposed to 0.0028 µg (half the LOD for diptank operators = 0.0056 µg). Bestari et al. provided the calculations for all samples above the detection limit. Versar calculated concentrations for those samples below the detection limit.

$$\text{Concentration } (\mu g/m^3) = \frac{\text{DDAC Found } (\mu g) \times 1000 \ (L/m^3)}{\text{Average Flow Rate } (L/min) \times \text{Time } (480 \text{ min.})}$$

Example:
Chemical Operator (2:2) $\mu g/m^3 = (0.0028\ \mu g /(2.087\ L/min * 480\ min))*1000\ L/m^3 = 0.002795\ \mu g/m^3$

** where 2.087 L/min was equal to the average flow rate of air exposed to that particular volunteer was.

Table A2: Excel Calculations and Data Table for DDA Carbonate Exposures

	Chem. Op mg Dermal	Chem Op µg/m³ Inhalation	Grader mg Dermal	Grader µg/m³ Inhalation	Trim Saw mg Dermal	Trim Saw µg/m³ Inhalation	Millwright mg Dermal	Millwright µg/m³ Inhalation	Cleanup Crew mg Dermal	Cleanup crew µg/m³ Inhalation
	2.1875	6.3125	1.90625	0.001812	0.4875	0.0017715	0.81875	0.0018229	42.6625	0.0018697
	3.81875	0.0017469	4.66875	0.0018302	1.2375	7.6875	18.175	0.001769	0.45	0.0017428
	3.79375	0.0017436	0.68125	0.0018193			5.01875	9.75	103.74375	18.9375
	28.98125	0.0017647	6.56875	0.0018774					59.5125	257.5
	0.5875	0.0018339	0.38125	0.001763					0.75	0.0017724
	13.84375	0.0017707	0.6125	0.0017802					0.1625	0.0017562
	13.40625	0.0017336	1.64375	0.0018193						
	0.1375	0.0017037	3.26875	0.0017802						
	0.275	0.0017336	0.11875	8.25						
	0.20625	0.0019633	0.91875	0.0018067						
	0.18125	0.0018004	1.4875	0.0017828						
			2.55625	0.0017579						
			0.64375	0.0018395						
Avg.	**6.1289773**	**0.5754813**	**1.9581731**	**0.6362822**	**0.8625**	**3.8446358**	**8.0041667**	**3.2511973**	**34.546875**	**46.074107**
min	0.1375	0.0017037	0.11875	0.0017579	0.4875	0.0017715	0.81875	0.001769	0.1625	0.0017428
max	28.98125	6.3125	6.56875	8.25	1.2375	7.6875	18.175	9.75	103.74375	257.5

Values are identical to those found in Table A1, but multiplied by a conversion factor of 0.625, to account for the differences in percent active ingredients of the two products (50% DDA Carbonate / 80% DDA Chloride).

Sign-off Date : 11/01/04
DP Barcode Nos. : D303714 and D303938