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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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

OFFICE OF  
PREVENTION, PESTICIDES  
AND TOXIC SUBSTANCES

MEMORANDUM

DATE: 15-FEB-2002

SUBJECT: Chronic Dietary Exposure Assessment for the Risk Assessment of Glyphosate; PC codes 417300 & 103601; DP Barcode D280830; Case 292955; Submission S579658.

FROM: William H. Donovan, Ph.D., Chemist *William H. Donovan*  
Registration Action Branch 1 (RAB1)  
Health Effects Division (7509C)

THROUGH: G. Jeffrey Herndon, Branch Senior Scientist  
RAB1/Health Effects Division (7509C)

*G. Jeffrey Herndon*

and

Leung Cheng, Chemist  
Richard Griffin, Biologist *R. Griffin*  
Dietary Exposure Science Advisory Council (DESAC)  
Health Effects Division (7509C)

TO: William Dykstra, Toxicologist  
RAB1/Health Effects Division (7509C)



EPA Reviewer: William H. Donovan, Date 15-FEB-2002

**STUDY TYPE:** Chronic Dietary Exposure Assessment for the Human Health Risk Assessment for Glyphosate

**SYNONYMS:** N-(phosphonomethyl)glycine

**RESIDUE OF CONCERN:** The nature of the residue in plants and livestock is adequately understood. The residue of concern is glyphosate *per se* in plants and livestock commodities.

### **Executive Summary**

A chronic dietary exposure assessment was requested to determine the dietary exposure estimates associated with the use of glyphosate in/on grasses, Roundup Ready® wheat, and nongrass animal feeds to support the section 3 tolerance request. A previous chronic dietary exposure analysis incorporating all available tolerances using the DEEM™ program was completed on 31-JUL-2000 (D267589, W. Donovan), showing that the most highly exposed population subgroup occupied < 4% of the cPAD.

A unrefined Tier 1 chronic dietary risk assessment was conducted for all supported (i.e., currently registered and proposed) glyphosate food uses. Dietary risk estimates are provided for the general U.S. population and various population subgroups. This assessment concludes that for all included commodities, the chronic risk estimates are below the Agency's level of concern (<100% cPAD) for the general U.S. population (1.8% of the cPAD) and all population subgroups. The chronic dietary exposure estimate for Children 1-6 years old is 3.9% of the cPAD.

### **I. Introduction**

Exposure to pesticides can occur through food, water, residential and occupational means. Risk assessment incorporates both exposure and toxicity of a given pesticide. The risk is expressed as a percentage of a dose that could be expressed as a daily or a long term dose, to pose no unreasonable adverse effects. This is called the population adjusted dose (PAD), and is expressed as %PAD. References are available on the EPA/pesticides web site which discuss the acute and chronic risk assessments in more detail: "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 purpose of this memorandum is to summarize the results of the dietary risk assessment for

the general U.S. population and various population subgroups resulting from exposure to glyphosate through food. This risk assessment is an updated risk analysis that has been conducted for glyphosate. Previous dietary risk assessment was conducted by W. Donovan (31-JUL-2000, D267589).

## II. Toxicological Information

### *Chronic*

The chronic Reference Dose (cRfD) for regulatory purposes is 1.75 mg/kg/day. The Hazard Identification Assessment Review Committee (HIARC) selected a NOAEL of 175 mg/kg/day based on death, diarrhea, and nasal discharge in Dutch Belted rabbits at 350 mg/kg/day (LOAEL) (HED Doc. No. 012586, W. Dykstra & J. Rowland, 20-APR-1998; TXR No. 0050428, W. Dykstra, 22-JAN-2002). An uncertainty factor (UF) of 100 was applied to account for both the interspecies extrapolation and intra-species variability.

### *FQPA Recommendation*

The population adjusted dose (PAD) is a modification of the acute RfD or chronic RfD to accommodate the FQPA Safety Factor. The chronic PAD (cPAD) is equal to the cRfD divided by the FQPA Safety Factor:  $cPAD = cRfD / FQPA \text{ Safety Factor}$ . The FQPA Safety Factor Committee (SFC) recommended that the 10x factor to account for enhanced sensitivity of infants and children be removed (HED Doc. No. 012584, B. Tarplee and J. Rowland, 17-APR-1998). Since the HED FQPA SFC determined to remove the 10X Safety Factor, the cRfD is identical to the cPAD (1.75 mg/kg/day). Table 1 summarizes the relevant toxicological data needed for the present analysis.

**Table 1. Summary of Toxicological Dose and Endpoints for GLYPHOSATE for Use in Dietary Exposure Assessment**

Exposure Scenario	Dose Used in Risk Assessment, UF	FQPA SF and Level of Concern for Risk Assessment	Study and Toxicological Effects
Acute Dietary <u>females 13-50 years old and general population</u>	none	none	An acute dietary endpoint was not selected for the general population or females 13-50, since an appropriate endpoint attributable to a single exposure was not identified in the toxicology data base.
Chronic Dietary <u>all populations</u>	NOAEL= 175 mg/kg/day UF = 100 Chronic RfD = 1.75 mg/kg/day	FQPA SF = 1X $cPAD = cRfD / FQPA \text{ SF}$ = 1.75 mg/kg/day	Developmental Toxicity Study - rabbit LOAEL = 350 mg/kg/day based on diarrhea, nasal discharge and death in maternal animals
Cancer (oral, dermal, inhalation)	Cancer classification ("Group E")	Risk Assessment not required	No evidence of carcinogenicity

### **III. Residue Information**

Existing tolerance levels for glyphosate residues are listed under 40 CFR §180.364. The current recommendations for glyphosate tolerances on grasses, Roundup Ready® wheat, and nongrass animal feeds were based on crop field trial data (D265970, W. Donovan, 31-JAN-2002). The present chronic analysis was made using recommended tolerance-level residues, DEEM™ default concentration factors, and a 100% crop treated assumption (Tier 1 approach) for those commodities with proposed new tolerances together with commodities having existing tolerances. A full listing of the residue information used in the chronic analysis is given in Attachment 1.

### **IV. DEEM™ Program and Consumption Information**

Glyphosate chronic dietary exposure assessments were conducted using the Dietary Exposure Evaluation Model (DEEM™) software Version 7.73, which incorporates consumption data from USDA's Continuing Surveys of Food Intake by Individuals (CSFII), 1989-1992. The 1989-92 data are based on the reported consumption of more than 10,000 individuals over three consecutive days, and therefore represent more than 30,000 unique "person days" of data. Foods "as consumed" (e.g., apple pie) are linked to raw agricultural commodities and their food forms (e.g., apples-cooked/canned or wheat-flour) by recipe translation files internal to the DEEM software. Consumption data are averaged for the entire US population and within population subgroups for chronic exposure assessment, but are retained as individual consumption events for acute exposure 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 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 estimated exposure. Exposure estimates are expressed in mg/kg body weight/day and as a percent of the cPAD. This procedure is performed for each population subgroup.

HED notes that there is a degree of uncertainty in extrapolating exposures for certain population subgroups from the general U.S. population which may not be sufficiently represented in the consumption surveys, (e.g., nursing and non-nursing infants or Hispanic females). Therefore, risks estimated for these population subgroups were included in representative populations having sufficient numbers of survey respondents (e.g., all infants or females, 13-50 years).

### **V. Results/Discussion**

HED's level of concern is 100% of the PAD. That is, estimated exposures above this level are of concern, while estimated exposures at or below this level are not of concern. The DEEM analyses estimate the dietary exposure of the U.S. population and 26 population subgroups. The results reported in Table 2 are for the U.S. Population (total), all infants (<1 year old), children 1-6, children 7-12, females 13-50, males 13-19, males 20+, and seniors 55+. The results for the

other population subgroups are not reported in Table 2 . This is because the numbers of respondents in the other subgroups were not sufficient, and thus the exposure estimates for these subgroups contained higher levels of uncertainty. However, the respondents in these subgroups were also part of larger subgroups which are listed in Table 2. For example, nursing and non-nursing infants are included in all infants. The subgroups which are broken down by region, season, and ethnicity are also not included.

### Chronic Dietary Exposure Analysis

**Table 2. Results of Chronic Dietary Exposure Analysis**

Population Subgroup	cPAD (mg/kg/day)	Exposure (mg/kg/day)	% cPAD
U.S. Population (total)	1.75	0.031527	1.8
All Infants (< 1 year)	1.75	0.062218	3.6
Children 1-6 years	1.75	0.068016	3.9
Children 7-12 years	1.75	0.045529	2.6
Females 13-50	1.75	0.023473	1.3
Males 13-19	1.75	0.031938	1.8
Males 20+ years	1.75	0.026745	1.5
Seniors 55+	1.75	0.031744	1.3

### **VI. Discussion of Uncertainties**

Because the estimated exposure is well below HED's level of concern, any uncertainties are unlikely to cause the exposure to exceed a level of concern. The only uncertainties are those associated with the use of tolerance level residues, default concentration factors and 100 % CT.

### **VII. Conclusions**

A Tier 1 chronic dietary risk assessment was conducted for all supported glyphosate food uses. Dietary risk estimates are provided for the general U.S. population and various population subgroups. This assessment concludes that for all included commodities, the chronic risk estimates are below the Agency's level of concern (<100% cPAD) for the general U.S. population (1.8% of the cPAD) and all population subgroups. The chronic dietary exposure estimate for Children 1-6 years old is 3.9% of the cPAD.

## **VIII. List of Attachments**

Attachment 1: Glyphosate Tier 1 residue file for chronic DEEM™ analysis.  
Attachment 2: Glyphosate Chronic DEEM™ analysis.

cc: W. Donovan (RAB1); M. Sahafeyen (CEB1)  
RDI: L. Cheng (14-FEB-2002), R. Griffin (15-FEB-2002)  
W. Donovan:CM#2: 806-R:(703)305-7330

Attachment 1. Glyphosate residue file for chronic DEEM™ analysis.

Filename: C:\deemepa\417300\417300a.rs7 Chemical: Glyphosate  
 RfD(Chronic): 1.75 mg/kg bw/day NOEL(Chronic): 175 mg/kg bw/day  
 RfD(Acute): 0 mg/kg bw/day NOEL(Acute): 0 mg/kg bw/day  
 Date created/last modified: 02-07-2002/12:39:17/8 Program ver. 7.75

Food Code	Crop Grp	Food Name	Def Res (ppm)	Adj. Factors #1	Adj. Factors #2	Comment
98	0	Acerola	0.200000	1.000	1.000	P 3E2929
138	19B	Allspice	7.000000	1.000	1.000	P 9E6003
40	14	Almonds	1.000000	1.000	1.000	P 7F1893
498	4A	Amaranth	0.200000	1.000	1.000	P 8E2122
115	19B	Anise	7.000000	1.000	1.000	P 9E6003
52	11	Apples	0.200000	1.000	1.000	P 6F1861
53	11	Apples-dried	0.200000	8.000	1.000	P 6F1861
54	11	Apples-juice/cider	0.200000	1.300	1.000	P 6F1861
377	11	Apples-juice-concentrate	0.200000	3.900	1.000	P 6F1861
410	12	Apricot juice	0.200000	1.000	1.000	P 260044
59	12	Apricots	0.200000	1.000	1.000	P 260044
60	12	Apricots-dried	0.200000	6.000	1.000	P 260044
181	0	Artichokes-globe	0.200000	1.000	1.000	P 9E6003
203	1CD	Artichokes-jerusalem	0.200000	1.000	1.000	P 7F2016
491	0	Arugula	0.200000	1.000	1.000	P 8E2122
260	0	Asparagus	0.500000	1.000	1.000	P 8E3648
70	0	Avocados	0.200000	1.000	1.000	P 8F2021
497	9B	Balsam pear	0.500000	1.000	1.000	P 3E2845
264	0	Bamboo shoots	0.200000	1.000	1.000	P 9E6003
72	0	Bananas	0.200000	1.000	1.000	P 9F2223
73	0	Bananas-dried	0.200000	3.900	1.000	P 9F2223
378	0	Bananas-juice	0.200000	1.000	1.000	P 9F2223
265	15	Barley	20.000000	1.000	1.000	P 2E4118
116	19A	Basil	2.000000	1.000	1.000	P 9E6003
135	19A	Bay	2.000000	1.000	1.000	P 9E6003
258	6C	Beans-dry-blackeye peas/cowpea	5.000000	1.000	1.000	P 2E4118
249	6C	Beans-dry-broadbeans	5.000000	1.000	1.000	P 2E4118
259	6C	Beans-dry-garbanzo/chick pea	5.000000	1.000	1.000	P 2E4118
227	6C	Beans-dry-great northern	5.000000	1.000	1.000	P 2E4118
256	0	Beans-dry-hyacinth	5.000000	1.000	1.000	P 2E4118
228	6C	Beans-dry-kidney	5.000000	1.000	1.000	P 2E4118
229	6C	Beans-dry-lima	5.000000	1.000	1.000	P 2E4118
230	6C	Beans-dry-navy (pea)	5.000000	1.000	1.000	P 2E4118
231	6C	Beans-dry-other	5.000000	1.000	1.000	P 2E4118
251	6C	Beans-dry-pigeon beans	5.000000	1.000	1.000	P 2E4118
232	6C	Beans-dry-pinto	5.000000	1.000	1.000	P 2E4118
250	6B	Beans-succulent-broadbeans	5.000000	1.000	1.000	P 2E4118
234	6A	Beans-succulent-green	5.000000	1.000	1.000	P 2E4118
257	0	Beans-succulent-hyacinth	5.000000	1.000	1.000	P 2E4118
233	6B	Beans-succulent-lima	5.000000	1.000	1.000	P 2E4118
235	6A	Beans-succulent-other	5.000000	1.000	1.000	P 2E4118
236	6A	Beans-succulent-yellow/wax	5.000000	1.000	1.000	P 2E4118
253	6	Beans-unspecified	5.000000	1.000	1.000	P 2E4118
51	14	Beechnuts	1.000000	1.000	1.000	P 7F1893
325	M	Beef-kidney	4.000000	1.000	1.000	P 4F4312
326	M	Beef-liver	0.500000	1.000	1.000	P 0F2329
197	1AB	Beets-garden-roots	0.200000	1.000	1.000	P 7F2016
165	2	Beets-garden-tops(greens)	0.200000	1.000	1.000	P 8E2122
152	9B	Bitter melon	0.500000	1.000	1.000	P 3E2845
1	13A	Blackberries	0.200000	1.000	1.000	P 3E2930
380	13A	Blackberries-juice	0.200000	1.000	1.000	P 3E2930
7	13B	Blueberries	0.200000	1.000	1.000	P 3E2930
452	5B	Bok choy	0.200000	1.000	1.000	P 8E2122
2	13A	Boysenberries	0.200000	1.000	1.000	P 3E2930
41	14	Brazil nuts	1.000000	1.000	1.000	P 7F1893
104	0	Bread fruit	0.200000	1.000	1.000	P 9E3754
168	5A	Broccoli	0.200000	1.000	1.000	P 8E2122
451	5A	Broccoli-chinese	0.200000	1.000	1.000	P 8E2122
169	5A	Brussels sprouts	0.200000	1.000	1.000	P 8E2122



286	15	Buckwheat	0.100000	1.000	1.000	P 8E2122
382	1AB	Burdock	0.200000	1.000	1.000	P 7F2016
49	14	Butter nuts	1.000000	1.000	1.000	P 7F1893
170	5A	Cabbage-green and red	0.200000	1.000	1.000	P 8E2122
383	5B	Cabbage-savoy	0.200000	1.000	1.000	P 8E2122
194	0	Cactus pads (nopai)	0.500000	1.000	1.000	P 9E6003
301	0	Canola oil (rape seed oil)	10.000000	1.000	1.000	P 2E4118
106	0	Carambola (starfruit)	0.200000	1.000	1.000	P 6E3424
117	19B	Caraway	7.000000	1.000	1.000	P 9E6003
198	1AB	Carrots	0.200000	1.000	1.000	P 8E3676 7F2016
143	9A	Casabas	0.500000	1.000	1.000	P 3E2845
42	14	Cashews	1.000000	1.000	1.000	P 7F1893
222	1CD	Cassava (yuca blanca)	0.200000	1.000	1.000	P 7F2016
118	19B	Cassia	7.000000	1.000	1.000	P 9E6003
171	5A	Cauliflower	0.200000	1.000	1.000	P 8E2122
199	1AB	Celeriac	0.200000	1.000	1.000	P 1E4010
166	4B	Celery	0.200000	1.000	1.000	P 8E2122
384	4B	Celery juice	0.200000	1.000	1.000	P 8E2122
467	19B	Celery seed	7.000000	1.000	1.000	P 9E6003
483	0	Chayote	0.200000	1.000	1.000	P 7F2016
107	0	Cherimoya	0.200000	1.000	1.000	P 0E3881
61	12	Cherries	0.200000	1.000	1.000	P 260044
62	12	Cherries-dried	0.200000	4.000	1.000	P 260044
63	12	Cherries-juice	0.200000	1.500	1.000	P 260044
447	4A	Chervil	0.200000	1.000	1.000	P 8E2122
43	14	Chestnuts	1.000000	1.000	1.000	P 7F1893
366	P	Chicken-byproducts	1.000000	1.000	1.000	P 9F5096
367	P	Chicken-giblets(liver)	1.000000	1.000	1.000	P 9F5096
385	P	Chicken-giblets (excl. liver)	1.000000	1.000	1.000	P 9F5096
369	P	Chicken-lean/fat free w/o bones	0.100000	1.000	1.000	P 9F5096
114	1AB	Chicory	0.200000	1.000	1.000	P 7F2016
167	4A	Chicory(french/belgian endive)	0.200000	1.000	1.000	P 7F2016 & 8E2122
200	19A	Chives	2.000000	1.000	1.000	P 9E6003
111	0	Chocolate	0.200000	1.000	1.000	P 0E3857
110	0	Chocolate-cocoa butter	0.200000	1.000	1.000	P 0E3857
386	9B	Christophine	0.500000	1.000	1.000	P 3E2845
892	0	Chrysanthemum	0.200000	1.000	1.000	P 8E2122
495	0	Cilantro	7.000000	1.000	1.000	P 9E6003
119	19B	Cinnamon	7.000000	1.000	1.000	P 9E6003
20	10	Citrus citron	0.500000	1.000	1.000	P 4F4338
120	19B	Clove	7.000000	1.000	1.000	P 9E6003
75	0	Coconut-dried (copra)	0.100000	2.100	1.000	P 2F2680
387	0	Coconut-milk	0.100000	1.000	1.000	P 2F2680
299	0	Coconut-oil	0.100000	1.000	1.000	P 2F2680
76	0	Coconut-water	0.100000	1.000	1.000	P 2F2680
74	0	Coconut	0.100000	1.000	1.000	P 2F2680
112	0	Coffee	1.000000	1.000	1.000	P 6E1809
172	5B	Collards	0.200000	1.000	1.000	P 8E2122
121	19B	Coriander	7.000000	1.000	1.000	P 9E6003
267	15	Corn grain-bran	1.000000	1.000	1.000	P 8F3673
266	15	Corn grain-endosperm	1.000000	1.000	1.000	P 8F3673
289	15	Corn grain-oil	1.000000	1.000	1.000	P 8F3673
268	15	Corn grain/sugar/hfcs	1.000000	1.500	1.000	P 8F3673
388	15	Corn grain/sugar-molasses	1.000000	1.500	1.000	P 8F3673
237	15	Corn/pop	0.100000	1.000	1.000	P 8E2122
238	15	Corn/sweet	0.100000	1.000	1.000	P 8E2122
291	0	Cottonseed-meal	15.000000	1.000	1.000	P 8E2122
290	0	Cottonseed-oil	15.000000	1.000	1.000	P 8E2122
55	11	Crabapples	0.200000	1.000	1.000	P 6F1861
8	0	Cranberries	0.200000	1.000	1.000	P 0E2421
9	0	Cranberries-juice	0.200000	1.100	1.000	P 0E2421
389	0	Cranberries-juice-concentrate	0.200000	3.300	1.000	P 0E2421
144	9A	Crenshaws	0.500000	1.000	1.000	P 3E2845
180	4A	Cress-garden/field	0.200000	1.000	1.000	P 8E2122
191	4A	Cress-upland	0.200000	1.000	1.000	P 8E2122
148	9B	Cucumbers	0.500000	1.000	1.000	P 3E2845
122	19B	Cumin	7.000000	1.000	1.000	P 9E6003
10	13B	Currants	0.200000	1.000	1.000	P 3E2930
177	4A	Dandelion-greens	0.200000	1.000	1.000	P 8E2122
77	0	Dates	0.200000	1.000	1.000	P 9E3754
3	13A	Dewberries	0.200000	1.000	1.000	P 3E2930

123	19A	Dill	2.000000	1.000	1.000	P 9E6003
154	8	Eggplant	0.100000	1.000	1.000	
364	P	Eggs-white only	0.100000	1.000	1.000	P 9F5096
363	P	Eggs-whole	0.100000	1.000	1.000	P 9F5096
365	P	Eggs-yolk only	0.100000	1.000	1.000	P 9F5096
11	13B	Elderberries	0.200000	1.000	1.000	P 3E2930
178	4A	Endive-curley and escarole	0.200000	1.000	1.000	P 8E2122
179	19B	Fennel	7.000000	1.000	1.000	P 9E6003
78	O	Figs	0.200000	1.000	1.000	P 3E2929
44	14	Filberts (hazelnuts)	1.000000	1.000	1.000	P 7F1893
352	F	Fish-finfish/freshwater	0.250000	1.000	1.000	P 9F2163
354	F	Fish-finfish-saltwater-dried	0.250000	1.600	1.000	P 9F2163
353	F	Fish-finfish/saltwater (incl. tu	0.250000	1.000	1.000	P 9F2163
351	F	Fish-roe/caviar	0.250000	1.000	1.000	P 9F2163
349	F	Fish-shellfish	3.000000	1.000	1.000	P 3F2956
292	O	Flax seed	4.000000	1.000	1.000	00ND0025 (S18)
202	3	Garlic	0.200000	1.000	1.000	P 8E3676
109	O	Genip (spanish lime)	0.200000	1.000	1.000	P 0E3873
124	1CD	Ginger	0.200000	1.000	1.000	P 7F2016
450	1AB	Ginseng	0.200000	1.000	1.000	P 7F2016
331	M	Goat-kidney	4.000000	1.000	1.000	P 4F4312
332	M	Goat-liver	0.500000	1.000	1.000	P 0F2329
12	13B	Gooseberries	0.200000	1.000	1.000	P 3E2930
23	10	Grapefruit-juice	0.500000	2.100	1.000	P 4F4338
441	10	Grapefruit-juice-concentrate	0.500000	8.260	1.000	P 4F4338
448	10	Grapefruit peel	0.500000	1.000	1.000	P 4F4338
22	10	Grapefruit-peeled fruit	0.500000	1.000	1.000	P 4F4338
13	O	Grapes	0.200000	1.000	1.000	P 5F1560
15	O	Grapes-juice	0.200000	1.200	1.000	P 5F1560
392	O	Grapes-juice-concentrate	0.200000	3.600	1.000	P 5F1560
14	O	Grapes-raisins	0.200000	4.300	1.000	P 5F1560
315	O	Grapes-wine and sherry	0.200000	1.000	1.000	P 3E2930
164	8	Groundcherries	0.100000	1.000	1.000	
287	6C	Guar beans	5.000000	1.000	1.000	P 2E4118
393	O	Guava-juice	0.200000	1.000	1.000	P 1E2443
79	O	Guava	0.200000	1.000	1.000	P 1E2443
45	14	Hickory nuts	1.000000	1.000	1.000	P 7F1893
125	O	Hops	7.000000	1.000	1.000	P 9E6003
334	M	Horsemeat	4.000000	1.000	1.000	P 4F4312
126	1AB	Horseradish	0.200000	1.000	1.000	P 8E3676
16	13B	Huckleberries	0.200000	1.000	1.000	P 3E2930
395	O	Jobo	0.200000	1.000	1.000	P 9E6003
18	O	Juneberry	0.200000	1.000	1.000	P 9E6003
174	5B	Kale	0.200000	1.000	1.000	P 8E2122
97	O	Kiwi fruit	0.200000	1.000	1.000	P 3E2929
175	5A	Kohlrabi	0.200000	1.000	1.000	P 8E2122
24	10	Kumquats	0.500000	1.000	1.000	P 4F4338
204	3	Leeks	0.200000	1.000	1.000	P 8E3676
28	10	Lemons-juice	0.500000	2.000	1.000	P 4F4338
442	10	Lemons-juice-concentrate	0.500000	11.400	1.000	P 4F4338
27	10	Lemons-peel	0.500000	1.000	1.000	P 4F4338
26	10	Lemons-peeled fruit	0.500000	1.000	1.000	P 4F4338
243	6C	Lentils	5.000000	1.000	1.000	P 2E4118
182	4A	Lettuce-unspecified	0.200000	1.000	1.000	P 8E2122
176	4A	Lettuce-leafy varieties	0.200000	1.000	1.000	P 8E2122
192	4A	Lettuce-head varieties	0.200000	1.000	1.000	P 8E2122
32	10	Limes-juice	0.500000	2.000	1.000	P 4F4338
443	10	Limes-juice-concentrate	0.500000	6.000	1.000	P 4F4338
31	10	Limes-peel	0.500000	1.000	1.000	P 4F4338
30	10	Limes-peeled fruit	0.500000	1.000	1.000	P 4F4338
4	13A	Loganberries	0.200000	1.000	1.000	P 3E2930
108	O	Longan fruit	0.200000	1.000	1.000	P 9E3715
81	11	Loquats	0.200000	1.000	1.000	P 6F1861
96	O	Lychee-dried	0.200000	1.850	1.000	P 9E3715
95	O	Lychees (litchi)/fresh	0.200000	1.000	1.000	P 9E3715
46	14	Macadamia nuts (bush nuts)	1.000000	1.000	1.000	P 7F1893
132	19B	Mace	7.000000	1.000	1.000	P 9E6003
100	O	Maney (mammee apple)	0.200000	1.000	1.000	P 9E6003
80	O	Mangoes	0.200000	1.000	1.000	P 1E2490
128	19A	Marjoram	2.000000	1.000	1.000	P 9E6003

141	9A	Melons-cantaloupes-juice	0.500000	1.000	1.000	P 3E2845
142	9A	Melons-cantaloupes-pulp	0.500000	1.000	1.000	P 3E2845
145	9A	Melons-honeydew	0.500000	1.000	1.000	P 3E2845
146	9A	Melons-persian	0.500000	1.000	1.000	P 3E2845
280	15	Millet	0.100000	1.000	1.000	P 8E2122
244	6C	Mung beans (sprouts)	5.000000	1.000	1.000	P 2E4118
183	5B	Mustard greens	0.200000	1.000	1.000	P 8E2122
130	19B	Mustard seed	7.000000	1.000	1.000	P 9E6003
64	12	Nectarines	0.200000	1.000	1.000	P 260044
131	19B	Nutmeg	7.000000	1.000	1.000	P 9E6003
399	15	Oats-bran	20.000000	1.000	1.000	P 6E4645
269	15	Oats	20.000000	1.000	1.000	P 6E4645
245	0	Okra	0.500000	1.000	1.000	P 9E6003
397	9B	Okra/chinese (luffa)	0.500000	1.000	1.000	P 3E2845
82	0	Olives	0.200000	1.000	1.000	P 3E2929
300	0	Olive oil	0.200000	1.000	1.000	P 3E2929
206	3	Onions-dehydrated or dried	0.200000	9.000	1.000	P 8E3676
205	3	Onions-dry-bulb (cipollini)	0.200000	1.000	1.000	P 8E3676
262	3	Onions-green	0.200000	1.000	1.000	P 8E3676
36	10	Oranges-juice	0.500000	1.800	1.000	P 4F4338
33	10	Oranges-juice-concentrate	0.500000	6.700	1.000	P 4F4338
35	10	Oranges-peel	0.500000	1.000	1.000	P 4F4338
34	10	Oranges-peeled fruit	0.500000	1.000	1.000	P 4F4338
129	19A	Oregano	2.000000	1.000	1.000	P 9E6003
400	0	Palm hearts	0.200000	1.000	1.000	P 9E6003
302	0	Palm oil	0.100000	1.000	1.000	P 6H5115
85	0	Papayas-dried	0.200000	1.800	1.000	P 1E2443
86	0	Papayas-juice	0.200000	1.500	1.000	P 1E2443
84	0	Papayas-pulp	0.200000	1.000	1.000	P 1E2443
139	8	Paprika	0.100000	1.000	1.000	
184	4A	Parsley	0.200000	1.000	1.000	P 8E2122
225	1AB	Parsley roots	0.200000	1.000	1.000	P 7F2016
220	1AB	Parships	0.200000	1.000	1.000	P 7F2016
401	0	Passion fruit-juice	0.200000	1.000	1.000	P 9E3715
92	0	Passion fruit (granadilla)	0.200000	1.000	1.000	P 9E3715
87	0	Pawpaws	0.200000	1.000	1.000	P 9E6003
65	12	Peaches	0.200000	1.000	1.000	P 260044
66	12	Peaches-dried	0.200000	7.000	1.000	P 260044
402	12	Peaches-juice	0.200000	1.000	1.000	P 260044
940	0	Peanuts-hulled	0.100000	1.000	1.000	P 0F2329
293	0	Peanuts-oil	0.100000	1.000	1.000	P 0F2329
56	11	Pears	0.200000	1.000	1.000	P 6F1861
57	11	Pears-dried	0.200000	6.250	1.000	P 6F1861
404	11	Pears-juice	0.200000	1.000	1.000	P 6F1861
240	6C	Peas (garden)-dry	5.000000	1.000	1.000	P 2E4118
241	6AB	Peas (garden)-green	5.000000	1.000	1.000	P 2E4118
405	6B	Peas-succulent/blackeye/cowpea	5.000000	1.000	1.000	P 2E4118
47	14	Pecans	1.000000	1.000	1.000	P 7F1893
381	19B	Pepper/black	7.000000	1.000	1.000	P 9E6003
310	0	Peppermint	200.000000	1.000	1.000	P 4E4404
311	0	Peppermint-oil	200.000000	1.000	1.000	P 4E4404
156	8	Peppers-chilli incl jalapeno	0.100000	1.000	1.000	
157	8	Peppers-other	0.100000	1.000	1.000	
155	8	Peppers-sweet(garden)	0.100000	1.000	1.000	
88	0	Persimmons	0.200000	1.000	1.000	P 9E3754
158	8	Pimientos	0.100000	1.000	1.000	
90	0	Pineapples-dried	0.100000	5.000	1.000	P 2F2634
91	0	Pineapples-juice	0.100000	1.700	1.000	P 2F2634
406	0	Pineapples-juice-concentrate	0.100000	6.300	1.000	P 2F2634
89	0	Pineapples-peeled fruit	0.100000	1.000	1.000	P 2F2634
254	0	Pinenuts	1.000000	1.000	1.000	P 9E6003
50	0	Pistachio nuts	1.000000	1.000	1.000	P 9E6003
101	0	Pitanga (surinam cherry)	0.200000	1.000	1.000	P 9E6003
480	0	Plantains-green	0.200000	1.000	1.000	P 9F2223
94	0	Plantains-ripe	0.200000	1.000	1.000	P 9F2223
481	0	Plantains-dried	0.200000	3.900	1.000	P 9F2223
67	12	Plums (damsons)	0.200000	1.000	1.000	P 260044
68	12	Plums-prunes (dried)	0.200000	5.000	1.000	P 260044
69	12	Plums/prune-juice	0.200000	1.400	1.000	P 260044
93	0	Pomegranates	0.200000	1.000	1.000	P 1E3978

140	19B	Poppy	7.000000	1.000	1.000	P 9E6003
345	M	Pork-kidney	4.000000	1.000	1.000	P 4F4312
346	M	Pork-liver	0.500000	1.000	1.000	P 0F2329
210	1C	Potatoes/white-dry	0.200000	6.500	1.000	P 7F2016
209	1C	Potatoes/white-peeled	0.200000	1.000	1.000	P 7F2016
211	1C	Potatoes/white-peel only	0.200000	1.000	1.000	P 7F2016
208	1C	Potatoes/white-unspecified	0.200000	1.000	1.000	P 7F2016
207	1C	Potatoes/white-whole	0.200000	1.000	1.000	P 7F2016
361	P	Poultry-other-giblets(liver)	0.500000	1.000	1.000	P 0F2329
360	P	Poultry-other-lean (fat free) w/	0.100000	1.000	1.000	P 9E6003
149	9B	Pumpkin	0.500000	1.000	1.000	P 3E2845
58	11	Quinces	0.200000	1.000	1.000	P 6F1861
492	O	Radicchio	0.200000	1.000	1.000	P 8E2122
407	1AB	Radishes-japanese (daiken)	0.200000	1.000	1.000	P 7F2016
484	O	Radishes-oriental	0.200000	1.000	1.000	P 7F2016
212	1AB	Radishes-roots	0.200000	1.000	1.000	P 7F2016
213	2	Radishes-tops	0.200000	1.000	1.000	P 7F2016
5	13A	Raspberries	0.200000	1.000	1.000	P 3E2930
185	4B	Rhubarb	0.200000	1.000	1.000	P 8E2122
408	15	Rice-bran	0.100000	1.000	1.000	P 8E2122
271	15	Rice-milled (white)	0.100000	1.000	1.000	P 8E2122
270	15	Rice-rough (brown)	0.100000	1.000	1.000	P 8E2122
409	15	Rice-wild	0.100000	1.000	1.000	P 8E2122
127	19A	Rosemary	2.000000	1.000	1.000	P 9E6003
214	1AB	Rutabagas-roots	0.200000	1.000	1.000	P 7F2016
215	2	Rutabagas-tops	0.200000	1.000	1.000	P 7F2016
274	15	Rye-flour	0.100000	1.000	1.000	P 8E2122
273	15	Rye-germ	0.100000	1.000	1.000	P 8E2122
272	15	Rye-rough	0.100000	1.000	1.000	P 8E2122
295	O	Safflower-oil	0.100000	1.000	1.000	P 9E6003
294	O	Safflower-seed	0.100000	1.000	1.000	P 9E6003
494	O	Saffron	7.000000	1.000	1.000	P 9E6003
133	19A	Sage	2.000000	1.000	1.000	P 9E6003
216	1AB	Salsify(oyster plant)	0.200000	1.000	1.000	P 7F2016
134	19A	Savory	2.000000	1.000	1.000	P 9E6003
252	O	Sesame seeds	0.100000	1.000	1.000	P 9E6003
296	O	Sesame-oil	0.100000	1.000	1.000	P 9E6003
217	3	Shallots	0.200000	1.000	1.000	P 8E3676
339	M	Sheep-kidney	4.000000	1.000	1.000	P 4F4312
340	M	Sheep-liver	0.500000	1.000	1.000	P 0F2329
413	6A	Snowpeas	5.000000	1.000	1.000	P 2E4118
275	15	Sorghum (including milo)	15.000000	1.000	1.000	P 8F3672
102	O	Soursop (annona muricata)	0.200000	1.000	1.000	P 9E3754
414	O	Soursop-juice	0.200000	1.000	1.000	P 9E3754
303	6A	Soybean-other	20.000000	1.000	1.000	P 5F1536
307	6A	Soybeans-flour (defatted)	20.000000	1.000	1.000	P 5F1536
306	6A	Soybeans-flour (low fat)	20.000000	1.000	1.000	P 5F1536
305	6A	Soybeans-flour (full fat)	20.000000	1.000	1.000	P 5F1536
304	6A	Soybeans-mature seeds dry	20.000000	1.000	1.000	P 5F1536
297	6A	Soybeans-oil	20.000000	1.000	1.000	P 5F1536
255	6A	Soybeans-sprouted seeds	20.000000	0.330	1.000	P 5F1536
312	O	Spearmint	200.000000	1.000	1.000	P 4E4404
313	O	Spearmint-oil	200.000000	1.000	1.000	P 4E4404
186	4A	Spinach	0.200000	1.000	1.000	P 8E2122
150	9B	Squash-summer	0.500000	1.000	1.000	P 3E2845
415	9B	Squash-spaghetti	0.500000	1.000	1.000	P 3E2845
151	9B	Squash-winter	0.500000	1.000	1.000	P 3E2845
17	O	Strawberries	0.200000	1.000	1.000	P 3E2930
416	O	Strawberries-juice	0.200000	1.000	1.000	P 3E2930
282	1A	Sugar-beet	10.000000	1.000	1.000	P 7F04886
379	1A	Sugar-beet-molasses	10.000000	1.000	1.000	P 7F04886
283	O	Sugar-cane	2.000000	1.000	1.000	
284	O	Sugar-cane/molasses	30.000000	1.000	1.000	P 9H5196
103	O	Sugar apples (sweetsop)	0.200000	1.000	1.000	P 6E3424
298	O	Sunflower-oil	0.100000	1.000	1.000	P 6F3408
417	O	Sunflower-seeds	0.100000	1.000	1.000	P 6F3408
218	1CD	Sweet potatoes (incl yams)	0.200000	1.000	1.000	P 7F2016
418	2	Sweet potatoes-leaves	0.200000	1.000	1.000	P 8E2122
187	4B	Swiss chard	0.200000	1.000	1.000	P 8E2122
37	10	Tangelos	0.500000	1.000	1.000	P 4F4338

38	10	Tangerines	0.500000	1.000	1.000	P 4F4338
39	10	Tangerines-juice	0.500000	2.300	1.000	P 4F4338
420	10	Tangerines-juice-concentrate	0.500000	7.350	1.000	P 4F4338
201	1CD	Taro-root	0.200000	1.000	1.000	P 7F2016
190	2	Taro-greens	0.200000	1.000	1.000	P 8E2122
493	0	Tarragon	2.000000	1.000	1.000	P 9E6003
113	0	Tea	7.000000	1.000	1.000	P 1H5310 & 8H5568
136	19A	Thyme	2.000000	1.000	1.000	P 9E6003
163	8	Tomatoes-catsup	0.100000	2.500	1.000	
423	8	Tomatoes-dried	0.100000	14.300	1.000	
160	8	Tomatoes-juice	0.100000	1.500	1.000	
162	8	Tomatoes-paste	0.100000	5.400	1.000	
161	8	Tomatoes-puree	0.100000	3.300	1.000	
159	8	Tomatoes-whole	0.100000	1.000	1.000	
153	0	Towelgourd	0.500000	1.000	1.000	P 3E2845
355	P	Turkey-byproducts	1.000000	1.000	1.000	P 0F2329
356	P	Turkey-giblets (liver)	1.000000	1.000	1.000	P 0F2329
358	P	Turkey-lean/fat free w/o bones	0.100000	1.000	1.000	P 0F2329
449	P	Turkey-other organ meats	1.000000	1.000	1.000	P 0F2329
137	1CD	Turmeric	0.200000	1.000	1.000	P 7F2016
219	1AB	Turnips-roots	0.200000	1.000	1.000	P 7F2016
188	2	Turnips-tops	0.200000	1.000	1.000	P 8E2122
426	M	Veal-kidney	4.000000	1.000	1.000	P 4F4312
427	M	Veal-liver	0.500000	1.000	1.000	P 0F2329
431	14	Walnut oil	1.000000	1.000	1.000	P 7F1893
48	14	Walnuts	1.000000	1.000	1.000	P 7F1893
189	0	Watercress	0.200000	1.000	1.000	P 9E6003
147	9A	Watermelon	0.500000	1.000	1.000	P 3E2845
436	9A	Watermelon-juice	0.500000	1.000	1.000	P 3E2845
278	15	Wheat-bran	20.000000	1.000	1.000	P 8E2122
279	15	Wheat-flour	6.000000	1.000	1.000	N 0F6195
277	15	Wheat-germ	20.000000	1.000	1.000	P 8E2122
437	15	Wheat-germ oil	20.000000	1.000	1.000	P 8E2122
276	15	Wheat-rough	20.000000	1.000	1.000	P 8E2122
439	9B	Wintermelon	0.500000	1.000	1.000	P 3E2845
221	1CD	Yambean tuber (jicama)	0.200000	1.000	1.000	P 7F2016
224	1CD	Yautia (tannier)	0.200000	1.000	1.000	P 7F2016
6	13A	Youngberries	0.200000	1.000	1.000	P 3E2930

Attachment 2: Glyphosate Chronic DEEM™ analysis.

U.S. Environmental Protection Agency  
 DEEM Chronic analysis for GLYPHOSATE  
 Residue file name: C:\deemepa\417300\417300a.rs7 Adjustment factor #2 NOT used.  
 Analysis Date 02-07-2002/12:42:03 Residue file dated: 02-07-2002/12:39:17/8  
 Reference dose (RfD, Chronic) = 1.75 mg/kg bw/day  
 COMMENT 1: Updated RfD as per 11/20/2001 HIARC meeting

Ver. 7.73

(1989-92 data)

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 Total exposure by population subgroup  
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Population Subgroup	Total Exposure	
	mg/kg body wt/day	Percent of Rfd
U.S. Population (total)	0.031527	1.8%
U.S. Population (spring season)	0.030515	1.7%
U.S. Population (summer season)	0.031676	1.8%
U.S. Population (autumn season)	0.033139	1.9%
U.S. Population (winter season)	0.030648	1.8%
Northeast region	0.032151	1.8%
Midwest region	0.031804	1.8%
Southern region	0.030533	1.7%
Western region	0.032243	1.8%
Hispanics	0.028723	1.6%
Non-hispanic whites	0.031797	1.8%
Non-hispanic blacks	0.031755	1.8%
Non-hisp/non-white/non-black	0.031525	1.8%
All infants (< 1 year)	0.062218	3.6%
Nursing infants	0.027423	1.6%
Non-nursing infants	0.076863	4.4%
Children 1-6 yrs	0.068016	3.9%
Children 7-12 yrs	0.045529	2.6%
Females 13-19 (not preg or nursing)	0.026913	1.5%
Females 20+ (not preg or nursing)	0.022170	1.3%
Females 13-50 yrs	0.023473	1.3%
Females 13+ (preg/not nursing)	0.023477	1.3%
Females 13+ (nursing)	0.031755	1.8%
Males 13-19 yrs	0.031938	1.8%
Males 20+ yrs	0.026745	1.5%
Seniors 55+	0.022733	1.3%
Pacific Region	0.031744	1.8%

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13544



038831

<b>Chemical:</b>	<b>Glyphosate</b>
<b>PC Code:</b>	<b>417300</b>
<b>HED File Code</b>	<b>11000 Chemistry Reviews</b>
<b>Memo Date:</b>	<b>02/15/2002</b>
<b>File ID:</b>	<b>DPD280830</b>
<b>Accession Number:</b>	<b>412-02-0281</b>

**HED Records Reference Center**  
**05/14/2002**

