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

OFFICE OF  
PREVENTION, PESTICIDES, AND  
TOXIC SUBSTANCES

JUL 14 1995

**MEMORANDUM**

**SUBJECT:** Ethion RED: Acute Dietary Exposure Analysis.

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**Through:** William L. Burnam, Branch Chief  
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**TO:** Karen Whitby, Acting Chief  
Risk Characterization and Analysis Branch  
Health Effects Division (7509C)

**Action Requested**

Provide a revised dietary risk analysis to estimate acute dietary exposure and risk from ethion using anticipated residue (AR) estimates supplied by CBRS in citrus juices for the Reregistration Eligibility Decision Document (RED). A previous DRES acute analysis for the RED and is written in a DRES memo (J. Wintersteen memo, 8/17/94). Chronic exposure and risk are also addressed in the previous memo.

**Discussion**

In a previous ethion dietary exposure analysis in support of the Reregistration Eligibility Decision (RED), CBRS recommended for an increase in the tolerance for the citrus fruits group from 2.0 ppm to 5.0 ppm. In the dietary analysis for the RED, acute ARs for pulp and peel of citrus as well as acute ARs for meat and milk were incorporated into the analysis. The analysis resulted in unacceptable MOEs which were below 10. The Agency is generally not concerned when the MOEs resulting from an acute analysis based upon a human toxicity study are above 10. Further refinement of ethion's residues have been provided in a CBRS memo (B. Cropp-Kohlligian memo, 6/29/95).

1/8

Toxicological Endpoint:

The NOEL of 0.05 mg/kg/day based upon plasma cholinesterase inhibition in a 21 day oral human study is recommended as the acute toxicological endpoint (M. VanGemert document, 3/14/94). The dog subchronic and chronic studies, which were co-critical, indicate a NOEL of 0.05 mg/kg/day for *brain* cholinesterase inhibition.

Residue Information

Food uses evaluated in this analysis were only the uses of ethion supported in reregistration, that is, a citrus group tolerance in Florida and Texas and meat and milk tolerances. There are numerous other tolerances still registered in 40 CFR §180.173, 185.2750 and 186.2750. CBRS provided anticipated residue (AR) estimates for ethion residues of concern using an available feeding study (MRIDs 00073138 and 00073153) and a proposed feed additive tolerance for residues of ethion in dried citrus pulp (25 ppm) for the determination of ethion acute anticipated residue level estimates for meat and milk. Calculated ethion concentration/reduction factors for citrus peel (6.2x) and citrus pulp (0.02x) were used in conjunction with the proposed tolerance increase (5.0 ppm) to determine the ethion acute anticipated residue level estimates for the citrus group.

Further acute anticipated residues have recently been provided for citrus juices. Since some juices tend to be mixed before consumption and some juices are freshly squeezed by consumers DRES has used two different residue approaches. For juices which are typically mixed, the average anticipated residue for the fruit will be multiplied by the average processing factor for the fruit. Since it is not uncommon to squeeze your own orange or lemon juice, a more conservative anticipated residue, but less conservative than the tolerance level, was calculated by multiplying the highest average residue value found in the field trial study by the average processing factor. The entire list of residues used in the analysis are found on Table 1, "Acute Residues Used in Ethion DRES Analysis".

The following residues are shown in comparison to the tolerance level for citrus.

<u>Commodity</u>	<u>Tolerance</u>	<u>Acute AR</u>
Citrus peel	5.0 ppm	31.0 ppm
Citrus pulp	5.0 ppm	0.1 ppm
Tangerine juice	5.0 ppm	0.175 ppm
Lemon juice	5.0 ppm	0.224 ppm
Grapefruit juice	5.0 ppm	0.119 ppm
Lime juice	5.0 ppm	0.154 ppm
Orange juice	5.0 ppm	0.231 ppm

The following are the values of average or highest average field trial residue and average processing factor for the citrus group. The acute anticipated residue for the juice is also listed.

<u>Average anticipated residue</u>	<u>Average Processing Factor</u>	<u>Acute AR for Juice</u>
grapefruit 1.7 ppm	0.07	0.119 ppm
Lime 2.2 ppm	0.07	0.154 ppm
Tangerine 2.5 ppm	0.07	0.175 ppm

Highest Average Field Trial Residue

Orange 3.3 ppm	0.07	0.231 ppm
Lemon 3.2 ppm	0.07	0.224 ppm

Results

Summaries of the acute dietary risk for the subgroups U. S. Population, Infants (< 1 year old), Children (1-6 years old), Females(13+ years) and Males (13+ years) are attached as Tables 1 and 2.

<b>Subgroup</b>	<b>High End MOE</b>	<b>Percentile MOE</b>
U.S. Population	7	(98th) 17
Infants (< 1 yr)	3	(95th) 13
Children (1-6)	3	(97th) 10
Females (13+)	10	(98th) 25
Males (13+)	13	(95th) 50

**Acute Exposure:**

The DRES detailed acute analysis estimates the distribution of single-day exposures for the overall U.S. population and certain subgroups. The analysis evaluates individual food consumption as reported by respondents in the USDA 1977-78 Nationwide Food Consumption Survey (NFCS) and accumulates exposure to the chemical for each commodity. Each analysis assumes uniform distribution of ethion in the commodity supply.

The Margin of Exposure (MOE) is a measure of how close the exposure comes to the NOEL (the highest dose at which no effects were observed in the laboratory test), and is calculated as the ratio of the NOEL to the exposure (NOEL/exposure = MOE). Since the toxicological effects to which exposure is being compared in this analysis are plasma and brain cholinesterase inhibition, all DRES subgroups are of concern. For substances whose acute NOEL is based on human studies, the Agency is not generally concerned unless the

high end MOE is below 10. The percent of the population that are considered consumers in the analysis ranged from 100% for the U.S. population to 89% for infants.

Although percent of crop treated is not incorporated into the acute analysis some information was provided by BEAD for the RED regarding citrus treated with ethion. The percent of crop treated estimated annual usage for 1990-1993 for oranges and grapefruit processed fruit was 75-85%. Also, the percent of crop treated for fresh fruit, again for 1990-1993, ranged from 97% for limes, 60% for oranges, 67% for grapefruit and an overall 56% for total citrus. Although DRES makes a conservative assumption in the acute analysis that 100% of the citrus and meat and milk are treated with ethion, the actual usage data seems to indicate that the use of ethion is very high in the citrus market and our assumption may not be much of an overestimate.

The results of this analysis indicate that ethion in the diet represents a risk of concern in all subgroups except Males (13+ years). However, the MOEs are acceptable at the 95th percentile. Since the toxicological endpoint appears to be both plasma and brain cholinesterase inhibition and the residues used in the analysis are very refined it is perhaps most appropriate to consider the most highly exposed individual in the population for regulatory purposes instead of some lesser percentile.

#### Attachments

cc: DRES; Caswell 427; RD (PM 13, R. Forrest); CBRS (B. Kohlligian)

4

Acute Residues Used in Ethion DRES Analysis

Cas.	Foodcode	Residue	Food	Cas.	Foodcode	Residue	Food
427	02001AA22	5.0000	CITRUS CITRON	427	02006JA15	0.2310C	ORANGES-JUICE
427	02002AA00	5.0000	GRAPEFRUIT-UNSP	427	02006JA31	0.2310C	ORANGES-JUICE
427	02002AB10	0.1000	GRAPEFRUIT-PULP	427	02007AA10	5.0000	TANGELLOS
427	02002AB21	0.1000	GRAPEFRUIT-PULP	427	02008AA10	5.0000	TANGERINES
427	02002JA15	0.1190C	GRAPEFRUIT-JUICE	427	02008JA15	0.1750C	TANGERINE-JUICE
427	02002JA31	0.1190C	GRAPEFRUIT-JUICE	427	50000FA10	0.0100C	MILK-FAT SOLIDS
427	02003AA10	5.0000	KUMQUATS	427	50000FA21	0.0100C	MILK-FAT SOLIDS
427	02004AA10	5.0000	LEMONS-UNSPEC	427	50000FA51	0.0100C	MILK-FAT SOLIDS
427	02004AA22	5.0000	LEMONS-UNSPEC	427	53001BA21	0.0080	BEEF-MEAT BYP
427	02004AB10	0.1000	LEMONS-PULP	427	53001BA26	0.0080	BEEF-MEAT BYP
427	02004AB31	0.1000	LEMONS-PULP	427	53001BB21	0.0080	BEEF-OTH ORGAN
427	02004HA10	31.0000	LEMONS-PEEL	427	53001BB51	0.0080	BEEF-OTH ORGAN
427	02004HA21	31.0000	LEMONS-PEEL	427	53001FA10	0.0800	BEEF-FAT
427	02004JA10	0.2240C	LEMONS-JUICE	427	53001FA21	0.0800	BEEF-FAT
427	02004JA15	0.2240C	LEMONS-JUICE	427	53001FA22	0.0800	BEEF-FAT
427	02004JA21	0.2240C	LEMONS-JUICE	427	53001FA23	0.0800	BEEF-FAT
427	02004JA31	0.2240C	LEMONS-JUICE	427	53001FA24	0.0800	BEEF-FAT
427	02005AA00	5.0000	LIMES-UNSPEC	427	53001FA25	0.0800	BEEF-FAT
427	02005AB10	0.1000	LIMES-PULP	427	53001KA21	0.0070	BEEF-KIDNEY
427	02005HA21	31.0000	LIMES-PEEL	427	53001LA25	0.0070	BEEF-LIVER
427	02005JA10	0.1540C	LIMES-JUICE	427	53001LA31	0.0070	BEEF-LIVER
427	02005JA15	0.1540C	LIMES-JUICE	427	53002BA00	0.0080	GOAT-MEAT BYP
427	02005JA31	0.1540C	LIMES-JUICE	427	53002BB00	0.0080	GOAT-OTH ORGAN
427	02006AA00	5.0000	ORANGES-UNSPEC	427	53002FA23	0.0800	GOAT-FAT
427	02006AB10	0.1000	ORANGES-PULP	427	53002FA25	0.0800	GOAT-FAT
427	02006AB21	0.1000	ORANGES-PULP	427	53002KA00	0.0070	GOAT-KIDNEY
427	02006HA21	31.0000	ORANGES-PEEL	427	53002LA00	0.0070	GOAT-LIVER
427	02006HA22	31.0000	ORANGES-PEEL	427	53002MA23	0.0080	GOAT-LEAN
427	02006HA31	31.0000	ORANGES-PEEL	427	53002MA25	0.0080	GOAT-LEAN

Acute Residues Used in Ethion DRES Analysis

Cas.	Foodcose	Residue	Food
427	53003AA00	0.0080	HORSE
427	53005BA21	0.0080	SHEEP-MEAT BYP
427	53005BB21	0.0080	SHEEP-OTH ORGAN
427	53005FA21	0.0800	SHEEP-FAT
427	53005KA21	0.0070	SHEEP-KIDNEY
427	53005LA00	0.0070	SHEEP-LIVER
427	53005MA21	0.0080	SHEEP-LEAN
427	53005MA31	0.0080	SHEEP-LEAN
427	53006BA21	0.0080	PORK-MEAT BYP
427	53006BB21	0.0080	PORK-OTH ORGAN
427	53006BB26	0.0080	PORK-OTH ORGAN
427	53006FA10	0.0800	PORK-FAT
427	53006FA21	0.0800	PORK-FAT
427	53006FA23	0.0800	PORK-FAT
427	53006FA25	0.0800	PORK-FAT
427	53006FA26	0.0800	PORK-FAT
427	53006KA21	0.0070	PORK-KIDNEY
427	53006LA21	0.0070	PORK-LIVER
427	53006LA25	0.0070	PORK-LIVER
427	53006MA21	0.0080	PORK-LEAN
427	53006MA25	0.0080	PORK-LEAN
427	53006MA26	0.0080	PORK-LEAN
427	53001MA10	0.0080	BEEF-LEAN
427	53001MA21	0.0080	BEEF-LEAN
427	53001MA22	0.0080	BEEF-LEAN
427	53001MA23	0.0080	BEEF-LEAN
427	53001MA24	0.0080	BEEF-LEAN

Note: Tolerance for meat = 0.2 ppm





