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OFFICE OF PREVENTION, PESTICIDES AND TOXIC SUBSTANCES

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HEALTH EFFECTS DIVISION
SCIENTIFIC DATA REVIEWS
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MEMORANDUM

Date: October 7, 2008

SUBJECT: **ETHOPROP.** Human Health Assessment Scoping Document in Support of Registration Review.

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Petition No.: N/A
Risk Assessment Type: N/A
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Executive Summary

Ethoprop or ethoprophos (O-ethyl S,S-dipropyl phosphorodithioate) is an organophosphate insecticide with tolerances on numerous crops. There are no residential uses for ethoprop.

A recent risk assessment was conducted for ethoprop (July, 2008) for the purpose of assessing new uses on hops and mints. The 2008 risk assessment evaluated new toxicity studies, including a developmental neurotoxicity study, selected new endpoints from comparative cholinesterase studies, followed current HED policy in evaluating the sensitivity of offspring and the FQPA safety factor, and included a new dietary assessment incorporating recent water monitoring data.

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The recent risk assessment found no risk concerns for occupational exposures for uses on hops and mint. The occupational assessment used a biomonitoring study with ethoprop which has undergone appropriate ethical review. A residential assessment was not conducted for the recent risk assessment and will not be required for registration review because there are no residential uses for ethoprop. There were no concerns for aggregate exposure in food and water from all uses of ethoprop. There were three reports found in the Incident Data System of individuals reporting symptoms consistent with ethoprop toxicity.

There are now requirements for an immunotoxicity study, an inhalation toxicity study, a postapplication dermal exposure study, and a postapplication inhalation exposure study. The recent 2008 risk assessment assessed worker risks only for hops and mints. During registration review, occupational handler and postapplication assessments for all other uses will need to be recalculated using new points of departure selected for the recent risk assessment and using current exposure duration definitions. Postapplication exposure data on mechanical transplantation is necessary in order to address quantitative risk assessment for crops that are mechanically transplanted (i.e., sugarcane). HED also recommends that all product labels for agricultural uses include a plant-back restriction prohibiting rotation to root and tuber vegetables.

Introduction

HED has evaluated the status of the human health assessments for ethoprop to determine whether sufficient data are available and whether any updates are needed to support Registration Review. Ethoprop is an organophosphate insecticide with tolerances on numerous crops. Occupational exposure to ethoprop can occur by dermal or inhalation routes. Non-occupational exposure is by the oral route in food or drinking water. There are no residential uses for ethoprop.

The main source of data for this scoping document was the recent risk assessment for ethoprop (July, 2008, D342754). In addition to the recent risk assessment, this scoping document also reviewed HED and OPPIN databases, and conducted an open literature search using PubMed®. The HED risk assessment team is Christine Olinger (dietary exposure), Matthew Lloyd (occupational exposure), and Kit Farwell (toxicologist and risk assessor).

Hazard Identification/Toxicology

The toxic mode of action of ethoprop in insects and humans is by inhibition of acetylcholinesterase (referred to as cholinesterase or ChE in this document) in the brain and peripheral nervous systems from phosphorylation of the enzyme. The resulting enzyme inhibition causes accumulation of the neurotransmitter, acetylcholine, and resulting signs of neurotoxicity.

Brain and red blood cell (RBC) ChE inhibition were the most sensitive endpoints of toxicity found in the guideline and literature studies. A slight anemia and liver toxicity (elevated liver enzymes and microscopic liver lesions) were also noted in dog studies. Ethoprop is acutely toxic and is in toxicity category I by both oral and dermal routes. The cancer classification is "likely to be carcinogenic to humans" based on malignant adrenal pheochromocytomas in male rats and

is regulated with a Q_1*. There are datagaps for an inhalation toxicity study (870.3465) and for an immunotoxicity study (870.7800). See Tables 1a and 1b.

The extensive toxicity database for ethoprop allowed for an evaluation of offspring sensitivity in the recent risk assessment and followed current HED policy on selection of the FQPA safety factor. The relevant studies included a developmental neurotoxicity study in rats, acute and 11-day comparative cholinesterase studies in adult and rat pups, adult and fetal comparative cholinesterase study, developmental toxicity studies in rats and rabbits, a 2-generation reproduction study, and acute and subchronic neurotoxicity studies in rats.

No developmental toxicity was noted in rat and rabbit developmental studies. Reproductive parameters evaluated in the 2-generation reproduction study were unaffected by treatment. Dosing for the high-dose group was reduced for the 2nd generation because of increased pup mortality. Parental toxicity at this dose included clinical signs due to ChE inhibition (tremors and loose stools) and significant inhibition of brain ChE activity. In the developmental neurotoxicity study, an effect on learning (water maze) in high-dose males was noted and motor activity was increased on postnatal day 17 in all male treatment groups, although the effect in the low dose group was believed to be close to a NOAEL. In the acute and repeated-dose comparative cholinesterase studies, pups were 8-12 times more sensitive relative to adults for brain cholinesterase inhibition, but had only 1.7 times the sensitivity as adults for RBC ChE activity.

The points of departure for dietary assessment were benchmark doses based on brain ChE inhibition in pups from the comparative cholinesterase studies. The comparative cholinesterase studies had close dose spacing around the NOAEL and LOAEL doses providing an accurate determination of $BMDL_{10}$ values. Furthermore, 1) the comparative cholinesterase studies provided an assessment of comparative sensitivity of adults and offspring; and 2) provided the lowest, most sensitive point of departure for the most vulnerable population which is protective of other effects described above. For these reasons, the FQPA safety factor was reduced to 1x.

There are datagaps for an inhalation toxicity study (870.3465) and for immunotoxicity testing (870.7800). See Tables 1a and 1b.

Dietary Exposure

Analytical method, storage stability, and magnitude of residue data were required in the 2002 RED to support the existing uses of ethoprop. These data have been received and reviewed (Olinger, 2007; Goodlow, 2007), and were adequate. All residue chemistry data requirements from the existing uses are fulfilled. Quantifiable ethoprop residues were found in limited crop rotational field trials for the root and tuber vegetables, so the registrant agreed to modify product labels should be amended to prohibit rotation to root and tuber vegetables (Piper, 1998). However, these label recommendations have not been implemented. HED continues to recommend for the rotational crop restriction for the root and tuber vegetables. Alternatively, the registrant could conduct extensive rotational crop field trials for root and tuber vegetables at the desired plant-back intervals and submit a petition for inadvertent residue tolerances.

A new dietary assessment was conducted in association with the proposed new uses on hops and mint (Olinger, 2008). The assessment was highly refined and included percent crop treated estimates generated in 2008, the most recent USDA Pesticide Data Program (PDP) monitoring data for the parent compound, and empirical processing factors for some commodities. Drinking water exposure estimates were incorporated directly into the assessment, including estimates from models as well as some surface water monitoring data from areas of high use. Acute, chronic, and cancer dietary assessments were conducted. The dietary risk from combined food and drinking water are well below the level of concern when drinking water estimates based on the monitoring data are used. If the modeled estimates are used, the level of concern is exceeded for the acute and cancer assessments. However, EFED has stated that the actual drinking water concentrations are likely to be much closer to the monitoring data than to the modeled estimates. Therefore, there are no risk concerns for exposure to ethoprop in food and drinking water.

No additional residue data are required and no further dietary assessments are needed.

Residential Exposure

Residential Handlers: There are no residential uses of ethoprop so residential exposures from direct use in that environment are not of concern. Since there are no residential uses of ethoprop, a residential risk assessment is not required based on the current use pattern.

Residential Postapplication: A residential postapplication risk assessment was performed in the September 2, 1999 HED Human Health Risk Assessment. In the past, residential exposures could have occurred through contact with treated golf course turf. Risk concerns identified at the time led all golf course turf uses to be voluntarily cancelled. Additionally, because ethoprop is applied as a granular and liquid that requires soil incorporation at the time of application, it is not expected to contribute to chemical trespass (e.g., spray drift). Since there are no currently registered residential uses for ethoprop or uses where residential contact is likely to occur, a residential risk assessment is not required at this time.

Aggregate Risk Assessment

The aggregate exposure is from food and water alone because there are no residential uses for ethoprop. As described in the dietary section above, there are no risk concerns for dietary exposure to ethoprop.

Occupational Exposure

Occupational Handler: Ethoprop is an organophosphate insecticide/nematicide registered for use on bananas/plantains, beans (lima and snap), cabbage, corn, cucumbers, sugarcane, ornamentals [field nursery stock only], potatoes, tobacco, hops, and mint. Ethoprop is manufactured by Bayer CropScience under the trade name MOCAP® and is formulated as either an emulsifiable concentrate (EC) or granular (G) for application to food/feed crops. These products may be applied as broadcast or banded preplant to preemergence applications and as banded postemergence applications directed to the soil. Use directions specify the use of only ground equipment.

The potential occupational handler exposure routes for ethoprop are dermal and inhalation. An exposure assessment for the short- and intermediate-term exposure duration is relevant for the current ethoprop registrations. Chronic (long-term) occupational exposures to ethoprop also do not occur (agricultural crops and vegetables) because the current labels specify that applications are to be made only pre-plant, at-plant, or pre-emergent, and specify only one application per year. Current labels specify discrete time intervals between applications; thus, it is assumed that even custom applicators would not receive long-term, chronic exposures (i.e., greater than 180 days) to ethoprop.

The Agency conducted a PHED-based exposure assessment for agricultural handlers of ethoprop in the recent risk assessment. For ethoprop liquid formulations, the Agency has risk concerns for dermal risks and most inhalation risks across most scenarios. The risk driver for the liquid formulations is the dermal route of exposure. For applications of the EC to agricultural field crops such as potatoes, sweet potatoes, and tobacco, the combined dermal and inhalation exposure scenarios with the highest MOE with engineering controls for mixer/loaders were ~5 and <10 for those applying the liquid with ground-boom equipment. For those granular product scenarios where engineering controls are feasible, which are generally associated with use on agricultural field crops such as potatoes, sweet potatoes, sugar cane and tobacco, the Agency has worker risk concerns for most of the combined (dermal plus inhalation) exposures.

As a result of the ethoprop IRED, the registrant conducted a biomonitoring-based study (MRID 45621501) to estimate risks for potato growers in the Pacific Northwest. Scenarios were evaluated for mixer/loader, applicator, and mixer/loader/applicator, based on the types of application equipment and crop sites listed on the various ethoprop labels. HED used these data to estimate occupational handler risks for occupational handlers in the Northwest on potatoes (D281648) and later bridged the biomonitoring data for the proposed uses on hops and mint (D352634/D352636). PHED-based risk estimates indicated risks of concern at the proposed label PPE (engineering controls/closed loading system), although risk estimates do not exceed HED's level of concern when the biomonitoring results are considered.

The cancer risks for ethoprop are based on custom applicators making 10 product applications per year. This is the "typical" number of applications that custom applicators would make in a year, based on data submitted by the registrant and confirmed by the Agency. For the occupational exposure scenarios with the EC where engineering controls are feasible, most of the cancer risks are greater than 1×10^{-6}, and are thus of concern to the Agency. For granular formulations, in those scenarios involving ground equipment where engineering controls are feasible, some had cancer risks which were less than 1×10^{-6}, and are not of concern to the Agency, and others greater than 1×10^{-6} (cancer risk estimates ranged from 2.0×10^{-6} to 5.9×10^{-5}).

Since the HED risk assessment and subsequent revisions (1999-2000), a number of risk mitigation measures have been required for the granular and liquid products.

The recent 2008 risk assessment selected updated toxicological endpoints for the new uses on hops and mints. For Registration Review, an updated occupational assessment will be required to incorporate these endpoints for all other ethoprop uses.

The occupational exposure scenarios, for uses other than hops and mints, have not been assessed based on current ORE policies (specifically, the Agency's June 6, 2001 revision of exposure duration definitions). Based on current product labels, the scenarios which should serve as the basis for the quantitative exposure and risk assessment (cancer and non-cancer), are as follows:

- Loading granulars for tractor drawn spreader application;
- Mixing/loading EC for groundboom application;
- Applying granulars with a tractor drawn spreader;
- Applying liquids with a groundboom sprayer;
- loading/applying granules with a tractor-drawn spreader to treat agricultural field crops, with PHED exposure data;
- loading/applying granules with a tractor-drawn spreader to treat agricultural field crops, with product-specific exposure data.

Occupational Postapplication: Because ethoprop is used in pre-plant and pre-emergent applications and is normally soil incorporated or watered-in, there are generally no concerns for postapplication exposure to agricultural workers. For both granular and EC formulations of ethoprop, HED believes the potential for postapplication exposure is low. There are no routine activities for most field crops that lead to potential exposures during the designated restricted entry intervals (REI) on the current labels of 48 hours, or 72 hours in outdoor areas where average rainfall is less than 25 inches per year, as required by the Worker Protection Standard. Sugarcane is an exception to this statement; however, sugarcane is mechanically transplanted and should have minimal postapplication concerns.

Occupational postapplication cancer risks are not required to be calculated given that ethoprop applications are pre-plant and pre-emergent and are normally soil incorporated or watered-in.

An updated occupational assessment will be required in Registration Review to incorporate updated toxicological endpoints and uncertainty factors. It should also be noted that likely upcoming policy revisions such as anticipated modifications in the unit exposure estimates from occupational handlers could also cause elements of the current exposure assessments to be revised (e.g., different unit exposure for groundboom tractor driver or re-consideration of hand transplanting activities in agriculture).

For ORE data gaps, the ethoprop Registration Review Team identified that postapplication dermal and inhalation exposure data on mechanical transplantation is necessary in order to address quantitative risk assessment for crops that are mechanically transplanted (i.e., sugarcane). Guideline numbers are 875.2400 and 875.2500, respectively. See Table 1c.

Public Health and Pesticide Epidemiology Data

An updated review of ethoprop incident reports was recently prepared (7/24/08, Monica Hawkins, M.P.H.) The OPP Incident Data System (IDS) was consulted for reports of poisoning

incidents occurring in the United States from 2000 to the present from the single chemical, ethoprop. The IDS includes reports of incidents from registrant reporting, from other government agencies, and from individual consumers. Three reports were found: a 23 year old male reported vomiting, headache, and blurred vision; a 30 year old male reported tingling and abdominal pain; and an adult male reported dizziness/vertigo, hypotension, shortness of breath, and erythema/flushed. There were no further details on how they were exposed.

Tolerance Assessment and International Harmonization

Tolerances have been established for numerous commodities and are defined for the parent only. During reregistration the registrant voluntarily removed the use of ethoprop on peanuts and the Agency proposed to revoke the tolerances on peanuts and peanut hay in a recent Federal Register Notice (6/4/08 Volume 73, Number 108, pp. 31788-31807). No maximum residue limits have been established in Canada, and Codex has established MRLs for many commodities as well. Commodities that have a US tolerance, but no Codex MRL, include lima beans, snap beans, cabbage, field corn, sweet corn, and pineapples. Conversely, the following commodities do not have a US tolerance, but a Codex MRL has been established: meat, meat by-products, milk, melons, sweet peppers, dried chili peppers, sugarcane fodder, strawberries, turnips, and tomatoes. The US tolerance and Codex MRL are harmonized for bananas and sugarcane. The US tolerance and Codex MRL are not harmonized for cucumbers, potatoes and sweet potatoes. Since the US tolerances and Codex MRLs for these commodities are relatively close, HED will review the residue data for these commodities during registration review to determine if the tolerances and MRLs can be harmonized.

Environmental Justice

Potential areas of environmental justice concerns, to the extent possible, were considered in this human health risk assessment, in accordance with U.S. Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," http://www.epa.gov/compliance/resources/policies/ej/exec_order_12898.pdf. The Office of Pesticide Programs (OPP) typically considers the highest potential exposures from the legal use of a pesticide when conducting human health risk assessments, including, but not limited to, people who obtain drinking water from sources near agricultural areas, the variability of diets within the U.S., and people who may be exposed when harvesting crops. Should these highest exposures indicate potential risks of concern, OPP further refines the risk assessments to ensure that the risk estimates are based on the best available information.

Cumulative

Ethoprop has already been evaluated in a cumulative assessment: Organophosphorus Cumulative Risk Assessment – 2006 Update (http://www.regulations.gov).

Human Studies

Ethoprop risk assessments rely in part on data from studies in which adult human subjects were intentionally exposed to a pesticide or other chemical. These studies, which comprise the Pesticide Handlers Exposure Database (PHED), have been reviewed by the Agency and found on the basis of

available evidence to have been neither fundamentally unethical nor significantly deficient relative to standards of ethical research conduct prevailing when they were conducted. There is no barrier in EPA's "Protection of Human Subjects" regulation to reliance on these studies.

In addition to the PHED studies, ethoprop risk assessments relied on biomonitoring data (MRID 45621501). This study, "Determination of Exposure to Mixer-Loaders and Applicators Who Handle Ethoprop During the Application of MOCAP® EC Nematicide-Insecticide to Potatoes" has received an ethics review and it was determined that all applicable requirements of EPA's Rule for the Protection of Human Subjects of Research (40 CFR Part 26) have been satisfied.

Table 1a. Data Requirements
Guideline Number: 870.7800 Study Title: Immunotoxicity
Rationale for Requiring the Data
This is a new data requirement under 40 CFR Part 158 as a part of the data requirements for registration of a pesticide (food and non-food uses). The Immunotoxicity Test Guideline (OPPTS 870.7800) prescribes functional immunotoxicity testing and is designed to evaluate the potential of a repeated chemical exposure to produce adverse effects (i.e., suppression) on the immune system. Immunosuppression is a deficit in the ability of the immune system to respond to a challenge of bacterial or viral infections such as tuberculosis (TB), Severe Acquired Respiratory Syndrome (SARS), or neoplasia. Because the immune system is highly complex, studies assessing functional immunotoxic endpoints are helpful in fully characterizing a pesticide's potential immunotoxicity. These data will be used in combination with data from hematology, lymphoid organ weights, and histopathology in routine chronic or subchronic toxicity studies to characterize potential immunotoxic effects.
Practical Utility of the Data
How will the data be used? These animal studies can be used to select endpoints and doses for use in risk assessment of all exposure scenarios and are considered a primary data source for reliable reference dose calculation. For example, animal studies have demonstrated that immunotoxicity in rodents is one of the more sensitive manifestations of TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin) among developmental, reproductive, and endocrinologic toxicities. Additionally, the EPA has established an oral reference dose (RfD) for tributyltin oxide (TBTO) based on observed immunotoxicity in animal studies (IRIS, 1997). **How could the data impact the Agency's future decision-making?** If the immunotoxicity study shows that the test material poses either a greater or a diminished risk than that given in the interim decision's conclusion, the risk assessments for the test material may need to be revised to reflect the magnitude of potential risk derived from the new data. If the Agency does not have this data, a 10X database uncertainty factor may be applied for conducting a risk assessment from the available studies.

Table 1b. Data Requirements
Guideline Number: 870.3465 Study Title: 90-Day inhalation toxicity study
Rationale for Requiring the Data
A 90-day inhalation study is required under 40 CFR Part 158 (October 26, 2007) "if there is the likelihood of significant repeated inhalation exposure to the pesticide as a gas, vapor, or aerosol". The ethoprop risk assessment (July, 2008, D353382) shows greater occupational risk by the inhalation route than by the dermal route for some scenarios. Inhalation exposure is presently assessed with a biomonitoring study for emulsifiable concentrate and by using an oral endpoint for the granular formulation.
Practical Utility of the Data
How will the data be used? A point of departure from the inhalation study will be used to assess postapplication risk from inhalation exposure using the required postapplication study (see below). An inhalation study will provide a more accurate assessment of risk from inhalation exposure than provided by using the biomonitoring exposure data compared to an oral endpoint. **How could the data impact the Agency's future decision-making?** If the inhalation study shows that the test material poses either a greater or a diminished risk than that using the biomonitoring data in conjunction with the oral endpoint, then the risk assessments for the test material may need to be revised to reflect the magnitude of potential risk derived from the new data.

Table 1c. Data Requirements

Guideline Number: 875.2400	Study Title: Postapplication Dermal Exposure Study
Guideline Number: 875.2500	Study Title: Postapplication Inhalation Exposure Study

Rationale for Requiring the Data

These studies are triggered when 1) there is the possibility of dermal contact to treated plants and other surfaces, and 2) residential SOPs predict high levels of dermal exposure after application of a pesticide, and 3) there is possibility of inhalation exposure after use of a pesticide. In the case of ethoprop, dermal and inhalation exposure to ethoprop is predicted to occur during mechanical transplantation as a result of the registered use of ethoprop on sugarcane.

Since the RED was signed, the Agency has worked to finalize its update to the data requirements in 40 CFR part 158, which were promulgated in October 2007. The Agency has expanded the data requirements for dermal and inhalation exposure studies (guidelines 875.2400 and 875.2500) to include postapplication exposure in occupational settings. Both studies are now required instead of conditionally required for all use patterns. These data requirement are specific to dermal and inhalation exposure that can occur around the postapplication activities for sugarcane (specifically mechanical transplantation). The Agency needs these postapplication dermal and inhalation data in order to complete occupational postapplication risk assessments for these scenarios. In addition, the original requirements were not broad enough to assess risks to semi-mechanical transplantation of sugarcane where postapplication exposures may be a concern.

Practical Utility of the Data

How did the Agency make its re-registration decision without this data?
The Agency made a decision in the 2001 IRED based on the granular, but not the emulsifiable concentrate (EC) formulation. The Agency delayed a final decision on the EC formulation as the registrant agreed to submit refined occupational biomonitoring and supporting pharmacokinetic (PK) data. The Agency's analysis of the data showed that when required engineering controls are utilized and appropriate PPE worn that exposure levels are low. The Agency believes that the occupational handler risk is greater than postapplication risk based on activity patterns although no confirmatory data are available.

Available environmental fate data demonstrates an additional rationale for this data requirement; ethoprop is mobile in soil with both aerobic and anaerobic soil metabolism studies showing half life values of approximately 100 days.

How will the data be used?
The study will be used to determine dermal and inhalation exposure for postapplication workers to the mechanical transplantation of sugarcane after a soil treatment with ethoprop.

How could the data impact the Agency's future decision-making?
These data are needed to fully characterize and quantify the exposure and risks to the postapplication workers in the U.S. exposed to this pesticide. Due to the lack of data, the Agency has used assumptions in developing the risk assessment. These data will allow the Agency to refine its risk assessment and could be used to defend challenges to the ethoprop decision.

Table 2. Memoranda Relevant to Registration Review			
Author	**Barcode**	**Date**	**Title**
Toxicology and Hazard			
K. Farwell	TXR 012589	4/21/98	Toxicology Chapter for the Reregistration Eligibility Document for ETHOPROP.
K. Farwell	none	2/6/98	Ethoprop. HED Metabolism Committee Meeting
K. Farwell	none	9/25/97	Evaluation of the Carcinogenic Potential of Ethoprop
Dietary and Residue Chemistry			
C. Olinger	352232 and 352234	7/3/08	Ethoprop. Acute (Probabilistic), Chronic, and Cancer Aggregate Dietary (Food and Drinking Water) Exposure and Risk Assessments for Proposed New Uses on Hops and Mint
C. Olinger	352476/352477	7/3/08	Ethoprop . Anticipated Residues to Support New Uses on Hops and Mint.
C. Olinger	352231 and 352233	5/12/08	Ethoprop. Petition for Registration of Uses on Mint and Hops. Summary of Analytical Chemistry and Residue Data.
T. Goodlow	324995 and 338603	7/5/2007	Ethoprop Reregistration: Submission of Magnitude of the Residue and Storage Stability Data in/on Cabbage, Potato, Dried Beans, and Succulent Beans.
C. Olinger	338601	7/3/07	Ethoprop Reregistration: Submission of Residue Analytical Method
S. Piper	245393	10/7/1998	Registrant's Response to Limited Rotational Crop Field Trials.
J. Abbots.	239294	3/27/98	Ethoprop (041101). Product and Residue Chemistry Chapters for the Reregistration Eligibility Decision (RED).
Drinking Water Exposure			
M. Barret	323344	12/18/07	Ethoprophos Drinking Water Assessment; Including Evaluation of Submitted Ground and Surface Water Monitoring Studies (Revised from 6/28/07 assessment).
M. Barret	342755 and 342794	6/17/08	Drinking Water Exposure Assessment for the IR-4 New Use Registration Petition for Ethoprop (Ethoprophos) on Mint and Hops
Occupational Exposure			
M. Lloyd	352634 and 352636	5/16/08	Ethoprop. Exposure/Risk Assessment for Pesticide Handlers and Agricultural Workers from the Proposed Uses on Hops and Mint.
M. Hawkins	None	6/24/08	Updated Review of Ethoprop Incident Reports
J. Carley	None	7/16/08	Ethics Review of Ethoprop Worker Exposure Study
J. Dawson	281648	3/1/05	ETHOPROP: Risk Assessment For Handlers In The Northwest On Potatoes Based On Biomonitoring Study (MRID 456215-01).
J. Dawson	D267298	10/23/00	Ethoprop - Review of Proposed Granular Risk Assessment Approach Outlined In June 30, 2000 Aventis Letter To The Agency
J. Dawson	D269012	10/27/00	Ethoprop - Review of Perceived Dust Study (MRID 452063-01) For Use In Granular Risk Assessment
J. Dawson	D261689 / D261740	5/18/00	Addenda to the Agency's Document Entitled Ethoprop: Revised Occupational/Non-occupational/Residential Exposure Assessment For Reregistration Eligibility Decision (RED) Document
C. Joseph	D258251	8/30/99	Ethoprop: Revised Occupational/Non-Occupational/Residential Exposure Assessment for the Reregistration Eligibility Decision (RED)
Risk Assessment			
K. Farwell	342754/342793	7/10/08	Ethoprop Risk Assessment for New Uses on Hops and Mints
Interim Reregistration Eligibility Decision			
SRRD	None	2/25/06	Addendum to the 2001 Ethoprop Interim Reregistration Decision (IRED) and the Interim Reregistration Eligibility Decision for Ethoprop
SRRD	None	2/2006	Addendum to the 2001 Ethoprop Interim Reregistration Eligibility Decision (IRED): Regulatory Decision on the Emulsifiable Concentrate (EC) Formulation of Ethoprop
SRRD	None	9/2001	Interim Reregistration Eligibility Decision for Ethoprop.

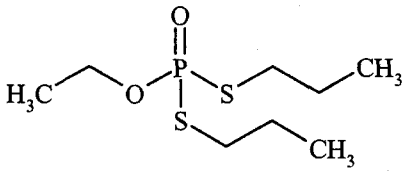
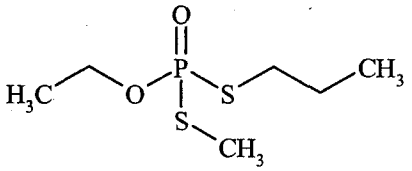
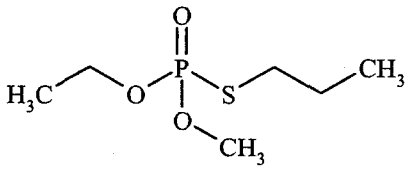
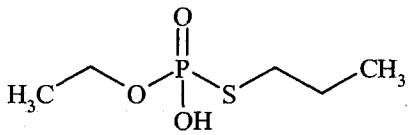
Table 3. Nomenclature of Ethoprop and its Metabolites of Concern.	
Compound	
Common name	Ethoprop
Company experimental name	Ethoprop
IUPAC and CAS name	*O*-ethyl-*S,S*-dipropyl phosphorodithioate
Chemical class	Organophosphate
CAS registry number	13194-48-4
End-use product (EP)	6 lb./gal EC (MOCAP® EC Nematicide-Insecticide, EPA Reg. No. 264-458) 15% G (MOCAP® 15% Granular Nematicide-Insecticide, EPA Reg. No. 264-457)
Compound	
Common name	Metabolite II (ethoprop S-Me)
Chemical name	*O*-ethyl-*S*-methyl-*S*-propyl phosphorodithioate
Compound	
Common name	Metabolite III (ethoprop O-Me)
Chemical name	*O*-ethyl-*O*-methyl-*S*-propyl phosphorodithioate
Compound	
Common name	Metabolite IV (M-1)
Chemical name	*O*-ethyl-*S*-propyl phosphorodithioate

Table 4 Summary of US and International Tolerances and Maximum Residue Limits			
Commodity	**Tolerances or MRLs (ppm)**		
	US	**Codex**	**Canada**
Banana	0.02	0.02	None
Bean, lima	0.02	None	None
Bean, snap, succulent	0.02	None	None
Cabbage	0.02	None	None
Corn, forage	0.02	None	None
Corn, grain	0.02	None	None
Corn, stover	0.02	None	None
Corn, sweet, kernel plus cob with husks removed	0.02	None	None
Cucumber	**0.02**	**0.01**	**None**
Meat	None	0.01(*)	None
Meat By-products (edible offal)	None	0.01(*)	None
Melons	None	0.02	
Milk	None	0.01(*)	None
Peanut	None	None	None
Peanut, hay	None	None	None
Peppers, Chili (dry)	None	0.2	None
Peppers, Sweet	None	0.05	None
Pineapple	0.02	None	None
Potato	**0.02**	**0.05**	**None**
Strawberry	None	0.02(*)	None
Sugarcane, cane	0.02	0.02	None
Sugarcane, fodder	None	0.02(*)	None
Sweet potato, roots	**0.02**	**0.05**	**None**
Tomato	None	0.01(*)	None
Turnip	None	0.02(*)	None

Note: The US tolerance definition and the Codex MRL definition include the parent ethoprop. Shaded values indicate the commodities where the US tolerance and Codex MRL are harmonized. Bolded values indicate the commodities where the US tolerance and Codex MRL are not harmonized. (*) Indicates that residues are not expected at the limit of quantitation.

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Chemical Name: Ethoprop

PC Code: 041101
HED File Code: 14100 Other Risk Documents
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