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

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

November 4, 2004

MEMORANDUM

TO: James Jones, Director
Office of Pesticide Programs

FROM: Lois Rossi, Director
Registration Division

SUBJECT: Completion of Inert Ingredient Tolerance Exemption Reassessment for the Oxo-Alkyl Acetates

The purpose of this memorandum is to document my decision on the reassessment of the tolerance exemptions for oxo-hexyl acetate (Hexanol, acetate, branched and linear, CAS Reg. No. 88230-35-7), oxo-heptyl acetate (Acetic acid, C6-8-branched alkyl esters, CAS Reg. No. 90438-79-2), oxo-octyl acetate (Acetic acid, C7-9 branched, alkyl esters, C8-rich, CAS Reg. No. 108419-32-5), oxo-nonyl acetate (Acetic acid, C8-10 branched alkyl esters, C9-rich, CAS Reg. No. 108419-33-6), oxo-decyl acetate (Acetic acid, C9-11-branched alkyl esters, C10-rich, CAS Reg. No. 108419-34-7), and oxo-tridecyl acetate (Acetic acid, C11-14 branched alkyl esters, C13-rich, CAS Reg. No. 108419-35-8) , in the absence of a Federal Register Notice. I consider the six tolerance exemptions established in 40 CFR 180.920 [formerly 40 CFR 180.1001(d)] for the oxo-alkyl acetates to be reassessed as of the date of this memorandum. A Federal Register Notice regarding this and other tolerance reassessment decisions will be published in the near future.

The Oxo-Alkyl Acetate Science Assessment was performed by the Inerts Team and reviewed by the Lower Risk Pesticide Chemical Focus Group. This review considered the available toxicity information and considered the potential hazard and exposure issues, to determine if there is sufficient information to make a finding of a reasonable certainty of no harm as required under the Food Quality Protection Act (FQPA). Following these considerations, both the Inerts Team and the Focus Group recommended for the reassessment of the six oxo-alkyl acetate chemicals.

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November 4, 2004

MEMORANDUM

SUBJECT: Tolerance Reassessment Decisions Completed by the Inerts Team and the Lower Risk Pesticide Chemical Focus Group

FROM: Lois Rossi, Director
Registration Division

TO: Peter Caulkins, Associate Director
Special Review and Reregistration Division

Please find attached the Science Assessment for the oxo-alkyl acetates. This document was prepared by the Inerts Team, and then reviewed by the Lower Risk Pesticide Chemical Focus Group. The six tolerance exemptions in 40 CFR 180.920 [formerly 40 CFR180.1001(d)] are reassessed. The following chemicals have been reclassified or confirmed as List 4B:

- oxo-hexyl acetate (Hexanol, acetate, branched and linear, CAS Reg. No. 88230-35-7)
- oxo-heptyl acetate (Acetic acid, C6-8-branched alkyl esters, CAS Reg. No. 90438-79-2)
- oxo-octyl acetate (Acetic acid, C7-9 branched, alkyl esters, C8-rich, CAS Reg. No. 108419-32-5)
- oxo-nonyl acetate (Acetic acid, C8-10 branched alkyl esters, C9-rich, CAS Reg. No. 108419-33-6)
- oxo-decyl acetate (Acetic acid, C9-11-branched alkyl esters, C10-rich, CAS Reg. No. 108419-34-7)
- oxo-tridecyl acetate (Acetic acid, C11-14 branched alkyl esters, C13-rich, CAS Reg. No. 108419-35-8)

If you have any comments or questions, please contact Kathryn Boyle at 703-305-6304.

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OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

November 4, 2004

MEMORANDUM

Subject: Oxo-Alkyl Acetates: Science Assessment/Recommendation for Tolerance Reassessment

From: Kathryn Boyle, Inerts Team
Minor Use, Inerts, and Emergency Response Branch
Registration Division (7505C)

To: Dan Rosenblatt, Chief
Minor Use, Inerts, and Emergency Response Branch
Registration Division (7505C)

Attached is the science assessment for the oxo-alkyl acetates. This assessment summarizes available information on the use, physical/chemical properties, toxicological effects, exposure profile, and environmental fate and ecotoxicity of these chemicals.

EPA concludes that there is a reasonable certainty that no harm will result to the general population (including infants and children) from the aggregate exposure to potential residues of the oxo-alkyl acetates resulting from their use as inert ingredients in pesticide products.

Lower Risk Pesticide Chemical Focus Group

Science Assessment for
Oxo-Alkyl Acetates

I. Executive Summary

This review is being conducted to reassess the existing inert ingredient tolerance exemptions for oxo-alkyl acetates as described below:

- oxo-hexyl acetate (Hexanol, acetate, branched and linear, CAS Reg. No. 88230-35-7)
- oxo-heptyl acetate (Acetic acid, C6-8-branched alkyl esters, CAS Reg. No. 90438-79-2)
- oxo-octyl acetate (Acetic acid, C7-9 branched, alkyl esters, C8-rich, CAS Reg. No. 108419-32-5)
- oxo-nonyl acetate (Acetic acid, C8-10 branched alkyl esters, C9-rich, CAS Reg. No. 108419-33-6)
- oxo-decyl acetate (Acetic acid, C9-11-branched alkyl esters, C10-rich, CAS Reg. No. 108419-34-7)
- oxo-tridecyl acetate (Acetic acid, C11-14 branched alkyl esters, C13-rich, CAS Reg. No. 108419-35-8)

The oxo-alkyl acetates are mixtures (not pure chemicals) that include branched and linear alkyl acetates with the general structure CH_3COOR, where R is a branched and/or linear alkyl group. The oxo-alkyl acetates are commercial solvents primarily used in surface coatings, but also in agricultural products. On the ExxonMobil website, these mixtures are marketed as the Exxate solvents (Exxate 600, 700, 800, 900, 1000, 1200, and 1300). The numeric designation in the Exxate product names refers to the number of carbons on the alkyl chain of the ester, e.g., Exxate 600 is a mixture of six-carbon alkyl acetate esters.

Oxo-alkyl acetates are minimally toxic or of low order acute toxicity following oral and dermal exposure. Studies indicate that oxo-alkyl acetates have a low systemic toxicity via oral exposure and are not mutagenic nor teratogenic. No studies on the acute inhalation effects of oxo-alkyl acetates were available; however, solvents such as these oxo-alkyl acetates are likely to demonstrate effects such as narcosis at higher concentrations.

Available ecotoxicity data indicate that select oxo-alkyl acetates are practically non-toxic to birds and present little or no potential hazard from their use. However, they may be moderately toxic to freshwater fish, invertebrates and algae.

Given the range of molecular weights and the differences in physical/chemical properties of the oxo-alkyl acetates it is expected that these chemicals could interact in the environment

differently. Additional data would better define the environmental fate properties of this group of chemicals.

Based on available information on the oxo-alkyl acetates, their use patterns, and their low toxicity, the Lower Risk Pesticide Chemical Focus Group has determined that a quantitative risk assessment is not required for these compounds.

II. Background

The tolerance exemptions for the six oxo-alkyl acetates were established in 1996 in response to pesticide petition 3E4267, as requested by Exxon Chemical Co., Performance Products Group now doing business as ExxonMobil. The data submitted in support of the petition was primarily for the oxo-octyl acetate and the oxo-tridecyl acetate, thus bracketing much of the C range (number of carbon atoms) of the various oxo-alkyl mixtures.

However, the Office of Pesticide Programs was not the first office in EPA to review the data and information on these chemicals. In the mid-1980s these chemicals were reviewed by the Office of Pollution Prevention and Toxics.

Records indicate that for the oxo-alkyl acetates, absorption was expected to be good through the GI tract, lung, and skin. Once absorbed, it was also expected that the oxo-alkyl acetates in the mammalian body would undergo hydrolysis to acetic acid and various alcohols. The alcohols would be oxidized to branched and unbranched carboxylic acids. OPPT's preliminary assessment resulted in the submission of data, which was reviewed and evaluated by OPPT. OPPT's data reviews were accessed with the full knowledge and cooperation of then Exxon Chemical.

High Production Volume (HPV) Challenge Program

HPV chemicals are those that are manufactured or imported into the United States in volumes greater than one million pounds per year. There are approximately 3,000 HPV chemicals that are produced or imported into the United States. The HPV Challenge Program is a voluntary partnership between industry, environmental groups, and the EPA which invites chemical manufacturers and importers to provide basic hazard data on the HPV chemicals they produce/import. The goal of this program is to facilitate the public's right-to-know about the potential hazards of chemicals found in their environment, their homes, their workplace, and in consumer products.

The Agency notes that these six oxo-alkyl acetates are included in the HPV Challenge Program. These chemicals are currently sponsored by ExxonMobil Chemical Company as a category: Alkyl Acetates C6-C13. It is noted that the HPV submission sent to the Agency was prepared by ExxonMobil. There is no information available to the Agency to describe any type of peer-review process used by ExxonMobil in the preparation of the robust summaries.

III. Use Information

The tolerance exemptions being reassessed in this document, the 40 CFR citation of the established tolerance exemptions, and the use pattern as an inert ingredient are listed below in Table 1.

Table 1. Tolerance Exemptions Being Reassessed in this Document

Tolerances Exemption Expression/ (CAS Nomenclature)	CAS No.	40 CFR ◊	Use Pattern	List* Classification
oxo-hexyl acetate/ (hexanol, acetate, branched and linear)	88230-35-7	180.920 [formerly 180.1001 (d)]	Solvent	3
oxo-heptyl acetate/ (acetic acid, C6-C8 branched alkyl esters)	90438-79-2	180.920 [formerly 180.1001 (d)]	Solvent	3
oxo-octyl acetate/ (acetic acid, C7-C9 branched alkyl esters, C8-rich)	108419-32-5	180.920 [formerly 180.1001 (d)]	Solvent	3
oxo-nonyl acetate/ (acetic acid, C8-C10 branched alkyl esters, C9-rich)	108419-33-6	180.920 [formerly 180.1001 (d)]	Solvent	NA
oxo-decyl acetate/ (acetic acid, C9-C11 branched alkyl esters, C10-rich)	108419-34-7	180.920 [formerly 180.1001 (d)]	Solvent	4B
oxo-tridecyl acetate/ (acetic acid, C11-C14 branched alkyl esters, C13-rich)	108419-35-8	180.920 [formerly 180.1001 (d)]	Solvent	3

◊Residues listed in 40 CFR 180.920 are exempted from the requirement of a tolerance when used in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only.

*Inert ingredients are categorized into four lists as described in the 1987 and 1989 Policy Statements. List 3, inert ingredients of unknown toxicity, are those inert ingredients for which there was no basis for listing the chemical on any of the other lists. List 4B inert ingredients are those inerts for which EPA has sufficient information to reasonably conclude that the current use pattern in pesticide products will not adversely affect public health or the environment.
NA = Not Available

The information available to the Agency indicates that the non-pesticidal uses of these oxo-alkyl acetate chemicals are primarily in paints/surface coatings. Searching the Household Products Database (http://hpd.nlm.nih.gov/) for all six of the oxo-alkyl acetate chemicals located only one product. The oxo-tridecyl acetate is contained in a spray can paint product at 0 to1%.

IV. Physical/Chemical Properties

The chemicals that are the subject of this document are the acetic acid esters of branched and linear hexyl, octyl, nonyl, decyl or tridecyl alcohols. Each of the mixtures is named for the chemical present in the largest percentage.

Available physical/chemical property data for the six oxo-alkyl acetates are presented in Table 2. The data (with the exception of specific gravity and as noted) were estimated by structural analysis using the EPIwin model and were reported in the 2002 Environmental Fate and Drinking Water Assessment prepared by the Office of Pesticide Programs' (OPP) Environmental Fate and Effects Division (EFED.) The specific gravity data from the material safety data sheets for these chemicals were reported by ExxonMobil in their 2000 Test Plan for the alkyl esters category under the HPV Chemical Challenge Program.

The chemical structure of each chemical is shown in Figure 1. These structures were also obtained from the EFED assessment.

Table 2. Physical/Chemical Properties of Oxo-Alkyl Acetates

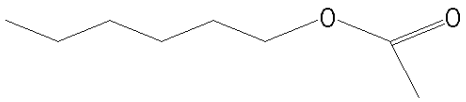
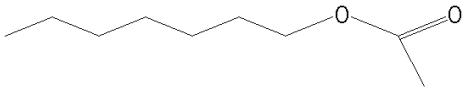
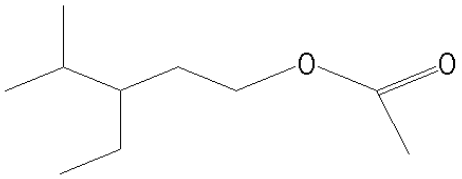
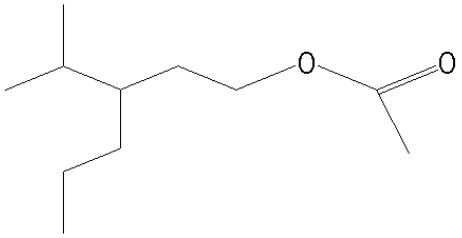
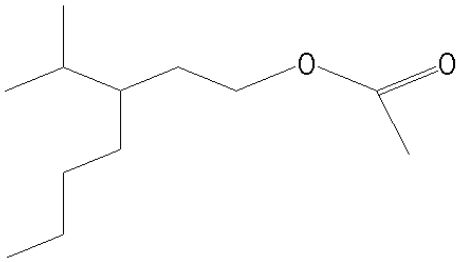
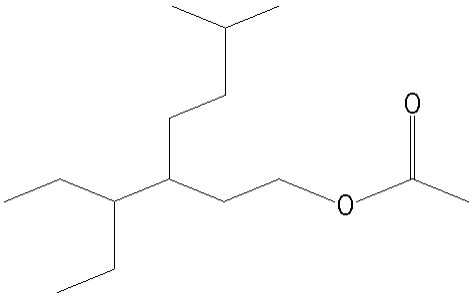
Property	Oxo-hexyl acetate	Oxo-heptyl acetate	Oxo-octyl acetate	Oxo-nonyl acetate	Oxo-decyl acetate	Oxo-tridecyl acetate
Molecular Formula	CH_3COOR, R is branched linear alkyl group, C6	CH_3COOR, C6-C8 branched alkyl esters	CH_3COOR, C7-C9 branched alkyl esters, C8-rich	CH_3COOR, C8-C10 branched alkyl esters, C9-rich	CH_3COOR, C9-C11 branched alkyl esters, C10-rich	CH_3COOR, C11-C14 branched alkyl esters, C13-rich
Physical State	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid
Solubility in Water	300 mg/L @ 25ºC	100 mg/L @ 25ºC	40 mg/L @ 25ºC	10 mg/L @ 25ºC	5 mg/L @ 25ºC	0.2 mg/L @ 25ºC
Density/Specific Gravity	0.87	0.87	0.87	0.87	0.87	0.87
Vapor Pressure	1.5 mm Hg @ 25ºC	0.5 mm Hg @ 25ºC	0.7 mm Hg @ 25ºC	0.1 mm Hg @ 25ºC	0.3 mm Hg @ 25ºC	0.01 mm Hg @ 25ºC
Octanol/Water Coefficient (logKow)	2.8	3.3	3.7	4.2	4.7	6.1
Hydrolysis Half-Life	2.1 years @ 25ºC, pH 7	2.1 years @ 25ºC, pH 7	2.1 years @ 25ºC, pH 7	2.1 years @ 25ºC, pH 7	2.1 years @ 25ºC, pH 7	2.1 years @ 25ºC, pH 7
Fugacity Half-Life	8.7 days	8.7 days	15 days	15 days	15 days	15 days*
Soil Sorption Coefficient (Koc)	70 mL/g o.c.	100 mL/g o.c.	200 mL/g o.c.	350 mL/g o.c.	600 mL/g o.c.	4,000 mL/g o.c.

Sources: EPA-OPP (EFED), Environmental Fate and Drinking Water Assessment (2002).

ExxonMobil Chemical Company, High Production Volume (HPV) Chemical Challenge Program Test Plan and Robust Summaries for the Alkyl Acetate C6-C13 Category (2000).

* Reported as 45 days in HPV Robust Summaries.

Figure 1. Chemical Structure of Oxo-Alkyl Acetates

Chemical	Structure
Oxo-hexyl acetate	
Oxo-heptyl acetate	
Oxo-octyl acetate	
Oxo-nonyl acetate	
Oxo-decyl acetate	
Oxo-tridecyl acetate	

V. Hazard Assessment

Three sources of information are used to assess the toxicity of oxo-alkyl acetates to human health: (1) a 1995 OPP/Health Effects Division (HED) review and evaluation of four mutagenicity studies using oxo-alkyl acetates; (2) a 1995 OPP/HED summary of Agency reviews and evaluations of acute, developmental, and subchronic toxicity studies using oxo-alkyl acetates; and (3) the HPV Test Plan and Robust Summaries prepared by ExxonMobil Chemical Company in 2000.

OPP/HED Review and Evaluation of Mutagenicity Studies

In 1995, OPP/HED reviewed and evaluated four mutagenicity studies using oxo-alkyl acetates (Exxate 800 and Exxate 1300). All four studies were classified as acceptable by the Agency, satisfying the guideline requirements for a gene mutation study or an *in vivo* mouse micronucleus study.

In the two gene mutation studies, *Salmonella*/ microsome plate incorporation assays with strains TA98, TA100, TA1535, TA1537, and TA1538 were exposed to Exxate 800 or Exxate 1300. The Exxate 800 (MRID 43191303) was applied at concentrations of 50, 100, 200, 400, and 600 µg/plate in the initial assay and at concentrations of 25, 50, 100, 200 and 400 µg/plate in a repeat assay. The Exxate 1300 (MRID 43191304) was applied at concentrations of 625, 1250, 2500, 5000, and 10,000 µg/plate in the initial assay and repeated, due to beading, at lower concentrations of 156, 312.5, 625, 1,250, and 2,500 µg/plate. All assays were conducted with and without exogenous metabolic activation. Positive and negative controls responded in a manner consistent with previous laboratory assays. Exxate 800 was cytotoxic to all strains of *Salmonella* exposed to ≥200 µg plate; no cytotoxicity was caused by Exxate 1300. There was no evidence from either study of induced mutant colonies over background at any dose, with or without exogenous metabolic activation, up to the maximum concentrations tested.

In the two mouse micronucleus studies, mice bone marrow micronucleus assays were each administered a single dose of Exxate 800 or Exxate 1300 by oral gavage. The Exxate 800 (MRID 43191305) was administered at doses of 625, 1250, and 2500 mg/kg body weight. The Exxate 1300 (MRID 43191306) was administered at doses of 450, 900, and 1800 mg/kg body weight. Cytotoxicity was observed in both studies at the 48-hr sampling time. Neither Exxate 800 nor Exxate 1300 significantly increased the frequency of micronucleated polychromatic erythrocytes in mouse bone marrow at any dose or sampling time.

The Agency concluded, "Based on the four mutagenicity studies submitted, there is no evidence that oxo-alkyl acetate (Exxate 800 and Exxate 1300) produces any mutagenic effects."

OPP/HED Summary of Agency Reviews and Evaluations of Toxicity Studies

In 1995, OPP/HED prepared two documents (D217439 and D196447), containing reviews and evaluations of the acute, developmental, and subchronic toxicity studies performed using oxo-alkyl acetates. All of the information discussed below are from those documents.

Acute Toxicity

Results of the reviews of the acute toxicity studies are summarized in Table 3.

Table 3. Acute Toxicity of Oxo-Alkyl Acetates

Chemical	Rat Oral LD50	Rabbit Dermal LD50	Rabbit Skin Irritation	Rabbit Eye Irritation
Oxo-Octyl Acetate	5000 mg/kg; Toxicity Category III	3200 mg/kg; Toxicity Category III	Minimal	Minimal
Oxo-Nonyl Acetate	5000 mg/kg; Toxicity Category III	3160 mg/kg; Toxicity Category III	Slight	Slight
Oxo-Decyl Acetate	5000 mg/kg; Toxicity Category III	3160 mg/kg; Toxicity Category III	Slight/Moderate	Slight
Oxo-Tridecyl Acetate	5000 mg/kg; Toxicity Category III	3160 mg/kg; Toxicity Category III	Slight	Slight
Oxo-Hexyl Acetate	10000 mg/kg; Toxicity Category IV	3160 mg/kg; Toxicity Category III	Slight	Moderate
Oxo-Heptyl Acetate	5000 mg/kg; Toxicity Category III	3160 mg/kg; Toxicity Category III	Slight	Moderate

It was concluded, “Based on the acute toxicity data noted above, oxo-alkyl acetates can be considered to be minimally toxic or of low order acute toxicity.”

Developmental Toxicity

Pregnant Sprague-Dawley rats were dosed with an oxo-octyl acetate mixture at dose levels of 100, 500, and 1000 mg/kg/day. The results of the study indicated that oxo-octyl acetate is not a selective developmental toxicant. The maternal systemic toxicity NOEL was determined to be 100 mg/kg/day and the developmental toxicity NOEL was 500 mg/kg/day. It was also noted that the developmental toxicity at 1000 mg/kg/day was biologically significant.

In a second study, pregnant Sprague-Dawley rats were dosed with an oxo-tridecyl acetate mixture at dose levels of 500, 1000, and 2500 mg/kg/day. Based on the results, oxo-tridecyl acetate is not regarded as a selective developmental toxicant. Both the maternal and developmental toxicity NOEL were determined to be 500 mg/kg/day. The adverse

developmental effects observed at 2500 mg/kg/day were noted by the reviewer as possibly being not biologically significant.

In a third developmental toxicity study in rats (MRID 45664504) oxo-octyl acetate was administered by gavage to 3 groups of 22 pregnant Sprague-Dawley rats/group on gestation days 6 through 15 at dose levels of 100, 500, and 1000 mg/kg/day. Decreased maternal body weight was noted at the 500 and 1000 mg/kg/day doses. Vertebral malformations were noted in four fetuses of four litters at the 1000 mg/kg/day dose. Malformed ribs were noted in one control and in one 100 mg/kg/day fetus. Based on these results, the maternal systemic NOEL was determined to be 100 mg/kg/day and the maternal LOEL was 500 mg/kg/day based on decreased body weight. The developmental toxicity NOEL was determined to be 500 mg/kg/day and the developmental toxicity LOEL was 1000 mg/kg/day based on increased incidence of various types of vertebral malformations.

When considering all three developmental toxicity studies "the Maternal Systemic Toxicity NOEL is 100 mg/kg/day and the maternal LOEL is 500 mg/kg based on decreased body weight. The Developmental Toxicity NOEL is 500 mg/kg/day and the developmental toxicity LOEL is 1000 mg/kg based on increased incidence of various types of vertebral malformations."

Subchronic Toxicity

Two published oral subchronic studies (1989/90) in rats were also reviewed and evaluated in 1995 by OPP (HED). In the two studies, four groups of 20 Sprague-Dawley rats/sex/group were dosed at 0, 100, 500, and 1000 mg/kg/day of oxo-octyl acetate (MRID 45664502) and oxo-tridecyl acetate (MRID 45664501) for 5 days a week for 13 weeks.

The reviewer indicated that for the oxo-octyl acetate study that the clinical signs were unremarkable. Only the body weights of the high-dose males and females were slightly lower(not statistically significant) than controls. This finding may be due to the slight lower food intake in the high-dose males. No microscopic treatment-related findings were noted to be associated with liver weight increases. The NOEL for oxo-octyl acetate was determined to be 100 mg/kg/day and the LOEL was 500 mg/kg/day based on increased liver weight in both sexes of rats.

The same EPA reviewer indicated for the oxo-tridecyl acetate study that the clinical signs were unremarkable and no rats died during the study. The body weights of the high-dose males and females were slightly lower (not statistically significant than the controls. Food intake differences among the groups were not evident. For oxo-tridecyl acetate, the NOEL was determined to be 100 mg/kg/day with a LOEL of 500 mg/kg/day based on increased incidence of tubular nephropathy in males and increased kidney and liver weight in both sexes. The reviewer also noted the similarities of the results of this study and the subchronic oxo-octyl acetate study.

Taken together, the results of these two oral subchronic studies in rats, using oxo-octyl and oxo-tridecyl acetates, "suggest that branched alkyl acetates in this molecular weight range (C8-C13 alkyl acetates) are of a low order of toxicity following subchronic administration at doses up to 1000 mg/kg/ body weight in rats." Additionally, the EPA reviewer indicated that the hydrocarbon nephropathy, seen in the male rats, may not be predictive of a human renal response and the tubular nephropathy may not be applicable for human risk assessment.

HPV Chemical Challenge Program Test Plan and Robust Data Summaries

The ExxonMobil Chemical Company submitted to the Agency (OPPT) their 2000 Test Plan for the alkyl acetates C6-C13 category under the HPV Chemical Challenge Program (AR201-12876). Included with the submittal were robust summaries for existing data for the Screening Information Data Set (SIDS) endpoints for substances included in this category. To the best of the Agency's knowledge, the data summaries have not been peer-reviewed. These robust summaries represent the viewpoint of ExxonMobil.

A summary of the toxicolological data endpoints from anchor studies (reliable studies with no restrictions) presented in ExxonMobil's test plan are shown in Table 4.

Table 4. Summary of Toxicology Data Endpoints for Alkyl Acetates C6-C13 (ExxonMobil Test Plan)

					Genotoxicity	
Name	**Oral LD_{50} - Rat**	**Dermal LD_{50}- Rabbit**	**Oral Repeated Dose - Rat**	**Development - Rat**	**Ames Test ± Activation**	**Chromosomal Aberration - *in vitro* or *in vivo***
Hexanol, acetate, branched and linear	>2 g/kg and >10 g/kg	>2 g/kg and >3.16 g/kg	28-day Gavage NOAEL = 1000 mg/kg/day	---	Negative	negative Chrom ABS (CHO)
Acetic acid, C6-8 branched alkyl esters	---	>3.16 g/kg	---	---	Negative	Negative Chrom ABS (CHO)
Acetic acid, C7-9 branched alkyl esters*	---	>3.16 g/kg	90-day Gavage NOEL = 100 mg/kg/day LOEL = 500 mg/kg/day**	Maternal NOAEL = 500 mg/kg and NOEL = 100 mg/kg; Pup NOAEL and NOEL = 500 mg/kg**	Negative**	Inactive CD-1 Mouse Micro-Nucleus**
Acetic acid, C8-10 branched alkyl esters*	---	>3.16 g/kg	---	---	---	---
Acetic acid, C9-11 branched alkyl esters*	---	>3.16 g/kg	---	---	---	---
Acetic acid, C11-14 branched alkyl esters	>5 g/kg	>3.16 g/kg	90-day Gavage NOEL = 100 mg/kg/day LOEL = 500 mg/kg/day**	Maternal NOAEL and NOEL = 500 mg/kg; Pup NOAEL and NOEL = 2500 mg/kg**	Negative**	Inactive CD-1 Mouse Micro-nucleus**

** Study reviewed by Agency; see previous sections for Agency evaluations.

ExxonMobil justifies evaluation of the alkyl acetates C6-C13 as a category based on their similar physiochemical and toxicological properties that follow a regular pattern as a result of the synthesis process. ExxonMobil states that structural similarities create a predictable pattern in the physiochemical properties, environmental fate and environmental effects, and/or human health effects. The similarities are based on: (1) a common structure (CH_3COOR); (2) an incremental and constant change across the category where R is a branched alkyl group with carbon numbers C6, C7, C8, C9, C10 or C13 as the main constituent; (3) a common functional ester group; and (4) a likelihood of common precursors and breakdown products which result in structurally similar chemicals (e.g., acetic acid and intermediate-chain aliphatic alcohols).

ExxonMobil further states that the test data compiled for the category studies "proves adequate to support a screening-level hazard assessment for the category and its members...One can assess the untested endpoints by extrapolation between and among the category members."

VI. Metabolism of Oxo-Alkyl Acetates

Specific metabolism studies on the oxo-alkyl acetates were not submitted to the Agency. However, information on the likely metabolic fate of hexyl acetate isomers is available (MRID 45664507). Generally mammals metabolize esters such as the oxo-alkyl acetates by breaking the chemical into the acid and the alcohol from which the ester is formed. Thus, the metabolic breakdown product would be acetic acid and various branched and linear C6 to C13 alcohols. The human body's ability to metabolize acetic acid is well-known. The alcohols would be metabolized to various branched and linear C6 to C13 acids and aldehydes, which would then be further metabolized.

ExxonMobil in its HPV submission states that the oxo-alkyl acetates (C_6-C_{13}) are metabolized by esterases to form acetic acid and the corresponding aliphatic alcohol. The acetyl residues formed following the metabolism by esterases will enter intermediary metabolism pathways or be broken down and excreted as carbon dioxide and water. The alcohol residues will likely be broken down by mitochondrial beta-oxidation or by cytochrome P450 mediated omega and omega-minus-one oxidation, which may be followed by beta-oxidation. Various oxidative steps will yield other alcohols, ketones, aldehydes, carboxylic acids, and carbon dioxide. The undegraded alcohols may be conjugated either directly or as a metabolite with glucuronic acid, sulfuric acid, or glycine and are rapidly excreted.

VII. Hazard Characterization

The hazard profile of the oxo-alkyl acetates is adequately defined. In the mammalian body, the acetate esters such as these oxo-alkyl acetates would be metabolized by known metabolic pathways. The oxo-alkyl acetate chemicals are not mutagenic and are not structurally related to any known carcinogens. The results of the subchronic toxicity studies indicate an overall low degree of systemic toxicity up to 1000 mg/kg/day. Results from three developmental and two subchronic toxicity studies using octyl and tridecyl acetate are summarized below in Table 5.

Table 5. Toxicity Endpoints for Oxo-Alkyl Acetates

Study	Toxicity Endpoints
developmental, rat (oral), (overall result of three studies)	100 mg/kg/day (NOEL) for maternal systemic effects 500 mg/kg/day (LOEL) based on decreased body weight 500 mg/kg/day (NOEL) for developmental effects 1000 mg/kg/day (LOEL) based on increased incidence of vertebral malformations
13 week subchronic, rat (oral), (overall result of two studies)	100 mg/kg/day (NOEL) for subchronic systemic effects 500 mg/kg/day (LOEL) based on increased kidney and liver weight.

The previous reviews were recently re-evaluated by Roger Gardner. His evaluation noted that the kidney endpoints are limited to male rats, and it is well known that the type of kidney toxicity seen in these studies is not always relevant for human risk assessment. Toxicity is indicated in females strictly with changes in body weight, food consumption, organ weights and organ to body weight ratios without accompanying histopathology. The body weight data in the subchronic study report is not consistent with that found in the developmental toxicity study report because (1) the weight effects may be reversible, (2) body weight decreases may have a stronger correlation with food consumption decreases than dose, or (3) the dosing regimens were not consistent. For example, the developmental toxicity study used 10 consecutive daily gavage doses while the subchronic study used no more than 5 consecutive daily gavage doses (5 days/week for 13 weeks). The weight decreases in the maternal animals in the developmental toxicity study also become less significant as the study progressed, and the weight changes seemed to be more closely related to food consumption rather than dose. Therefore, these effects are not clearly related to dose when all the studies (developmental and subchronic toxicity studies) are considered together, and they are unlikely to be adverse effects.

There is a consistent pattern of NOELs of 100 mg/kg/day in both subchronic toxicity studies and the maternal NOELs in the developmental toxicity studies. However, it is also noted in the previous reviews of the subchronic toxicity studies that at doses of up to 1000 mg/kg/day, there are no remarkable effects. Additionally, the developmental NOEL is 500 mg/kg/day. The NOELs of 100 mg/kg/day represent effects that did occur at the next higher dose level. However, it is also realized that the spacing between the NOEL and LOEL is large (from 5- to 10-fold), which indicates a shallow-slope for the dose-response curve. If additional doses had been selected from the range between the current NOELs and the LOELs based on the minimal toxicity observed in these studies, then the Agency might be in the position of selecting a different dose level for the NOEL or LOEL, thus giving a greater certainty to this side of the risk equation.

VIII. Special Considerations for Infants and Children

The Agency has reviewed three developmental toxicity studies. The maternal NOAEL is 100 mg/kg/day. The developmental NOAEL is 500 mg/kg/day. The oxo-alkyl acetates produce some evidence of developmental toxicity at doses that are greater that the doses that produce maternal toxicity, i.e., the mother is impacted before the developing fetus. There is no concern for the oxo-alkyl acetates for increased sensitivity to infants and children. A safety factor analysis has not been used to assess the risk, and the additional tenfold safety factor for the protection of infants and children is not needed.

IX. Drinking Water Considerations

In 2002 the Environmental Fate and Effects Division (EFED) estimated concentrations of oxo-alkyl acetates in water using screening-level models. Model-estimated upper percentile ranges of drinking water concentrations are based on a single, annual, aerial application at the rate of 1 lb/acre. The concentrations are reported as a range since various modeling runs accounted for different oxo-alkyl acetates and different degradation assumptions.

- Surface Drinking Water Concentrations (FIRST Index Reservoir Model)
  Acute (peak): 74 to 83 ppb
  Chronic (annual avg.): 2.7 to 52 ppb

- Ground Water (SCI-GROW Regression Model)
  0.084 to 73 ppb

- For comparison, estimated exposures for aquatic ecological effects are (GENEEC2 Model)
  Acute (peak): 49 to 55 ppb
  Chronic (90-day avg.): 18 to 54 ppb

To estimate acute drinking water exposure estimates, 83 ppb (highest surface water concentration) is converted to 0.0024 mg/kg/day for adults and 0.0083 mg/kg/day for children. For chronic drinking water exposure estimates, 73 ppb (highest ground water concentration) is converted to 0.0021 mg/kg/day for adults and 0.0073 mg/kg/day for children.

X. Screening-level Exposure Assessment

Various publicly-available screening-level models were used to estimate some of the existing levels of exposure that could occur in and around the home. To assure protectiveness, these models create estimates that are deliberately intended to over-estimate exposure. See Attachment 1 for the models and assumptions used.

Table 6: Screening-Level Exposure Estimates Conducted through Modeling	
Oral Exposures	
Type of Exposure	Potential Exposure Level
Dietary - Food (as a result of application to crops)	acute exposure: less than 1 mg/kg/day at 95th percentile chronic exposure: less than 1 mg/kg/day
Dietary - Drinking Water	acute exposure: 0.0024 mg/kg/day for adults and 0.0083 mg/kg/day for children chronic exposure: 0.0021 mg/kg/day for adults and 0.0073 mg/kg/day for children
Inhalation Exposures	
Residential (spray paint scenario) Note that there are no dermal inputs for this scenario.	inhalation acute exposure: ranging from 4.18 to 0.88 mg/kg/day

As previously noted, these exposures were generated by modeling that is intended to over-estimate. Also, the available information does not indicate an extensive use pattern for the oxo-alkyl acetates. There are no FDA-approved uses. The Agency, of course, understands the uses in the agricultural pesticide market. The only other uses identified are in surface coatings. There are very few uses in and around the home.

XI. Risk Characterization

Overall the oxo-alkyl acetate group of chemicals should be considered as chemicals of lower toxicity. These chemicals are metabolized by known pathways in the mammalian body. The NOELs in several subchronic and developmental toxicity studies are 100 mg/kg/day. It is also noted that there is a significant spacing between the NOEL and LOEL in these studies. This 5- to 10-fold difference indicates a shallow-slope for the dose-response curve. The demonstrated effects are not severe, and in fact the effects in the subchronic studies up to 1000 mg/kg/day are considered unremarkable by Agency reviewers.

The toxicity of the oxo-alkyl acetates is minimal with effects in subchronic studies considered “unremarkable” at doses up to 1000 mg/kg/day. The weight decreases in the maternal animals in the developmental toxicity study became less significant as the study progressed, and the weight changes seemed to be more closely related to food consumption rather than dose.

The exposures are considered to be over-estimated. The uses of the oxo-alkyl acetates is in the agricultural and the surface coatings markets. Risk is a function of hazard and exposure. Given the Agency’s understanding of the lower/minimal toxicity of the oxo-alkyl acetates, the

dose spacing of the toxicity studies, the known metabolic pathway of these chemicals, and the exposure pattern, there is no reason to expect that the reasonably foreseeable uses of the oxo-alkyl acetates will constitute any significant hazard.

XII. Environmental Fate and Ecotoxicity

Results of PBT Profiler

The PBT Profiler is an assessment tool that estimates environmental persistence (P), bioconcentration potential (B), and aquatic toxicity (T) of discrete chemicals based on their molecular structure. (See http://www.pbtprofiler.net) The PBT results for the oxo-acetate chemicals are below.

Table 7: Results of PBT Profiler

Chemical	Persistence (based on predominant media)	Bioaccumulation	Fish Aquatic Toxicity	Predominant Media	Half-Life in Predominant Media
Oxo-decyl acetate	**Low**	**Low**	**Medium**	Soil	30
Oxo-heptyl acetate	**Low**	**Low**	**Low**	Soil	30
Oxo-hexyl acetate	**Low**	**Low**	**Low**	Soil	30
Oxo-nonyl acetate	**Low**	**Low**	**Medium**	Soil	30
Oxo-octyl acetate	**Low**	**Low**	**Low**	Soil	30
Oxo-tridecyl acetate	**Medium**	**Low**	**Medium**	Soil	75

Environmental Fate Review by OPP

The 2002 OPP/EFED assessment qualitatively describes the environmental fate of the mixture of oxo-alkyl acetates. The assessment has a high degree of uncertainty and variability for two principal reasons: (1) all six of the given CAS numbers represent mixtures, not pure

chemicals; and (2) the typical set of environmental fate and mobility data typically reviewed by OPP for an active ingredient are not available for the components of the mixtures. EFED describes the environmental fate of oxo-alkyl acetates as follows:

- Abiotic hydrolysis and direct photolysis are not expected to be significant routes of dissipation under typical environmental conditions;

- Components of the mixtures range from readily biodegradable to not readily biodegradable and from mobile to relatively immobile with respect to leaching to groundwater and to runoff surface water;

- Volatilization is expected to be a minor route of dissipation (less than 10%) for the lower molecular weight components; and

- Bioconcentration of the higher molecular weight oxo-alkyl acetates is indicated based on their high octanol-to-water partitioning ratios.

Ecotoxicity Review by OPP

Four avian toxicity studies (MRIDs 43191307, -08, -09, -10) using oxo-alkyl acetates (Exxate 800 and 1300) were reviewed by EFED in 1994. All of the studies were classified as acceptable by the Agency, satisfying the guidelines for an avian single-dose LD_{50} test or an upland game bird dietary LC_{50} test.

The reviewed data indicate that the two chemicals are practically non-toxic to birds, with bobwhite quail LD_{50}s greater than 2250 mg/kg and LC_{50}s greater than 5620 ppm. Based on these data, EFED concluded "there is little or no potential for hazard to birds from the use of these inerts."

HPV Chemical Challenge Program Test Plan and Robust Data Summaries

Acute aquatic toxicity studies were reviewed by ExxonMobil and presented in their 2000 HPV Chemical Challenge Program Test Plan. ExxonMobil states that the reviewed data indicate that products ranging from the C6 branched and linear alkyl acetate ester to the C9-C11 branched alkyl acetate esters are moderately (acutely) toxic to freshwater fish and invertebrates, as well as freshwater algae.

In tests with rainbow trout and fathead minnows, the 96-hr LL_{50} and LC_{50}s ranged from 8.2 mg/L to 14.9 mg/L for the C6, C6-C8, and C7-C9 linear and branched alkyl acetate esters. In comparison, no mortality was observed with a fathead minnow exposed to a concentration of 5800 mg/L of the C11-C14 branched alkyl acetate ester. The lack of toxicity is due to the comparatively lower water solubility, which limits the exposure of aquatic organisms.

In acute toxicity tests using Daphnid exposed to C6, C7-C9, C9-C11 alkyl acetate esters, the 48-hr EL_{50}s and EC_{50} ranged from 6.7 mg/L to 29.4 mg/L. As with the acute toxicity tests using freshwater fish, no effects were observed when Daphnid were exposed to 5829 mg/L of the C11-C14 branched alkyl acetate ester.

Similar results were observed in acute toxicity tests with freshwater alga where EL_{50}s (biomass) of 40.1 mg/L and 19.4 mg/L were obtained for the C6 branched and linear alkyl acetate ester and the C7-C9 branched alkyl acetate ester, respectively. Again, no effects were observed when the alga were exposed to the C11-C14 branched alkyl acetate ester at a concentration of 5829 mg/L.

Ecotoxicity and Ecological Risk Characterization

Available ecotoxicity data indicate that select oxo-alkyl acetates are practically non-toxic to birds and present little or no potential hazard from their use. However, the chemicals may be moderately toxic to freshwater fish, invertebrates and algae.

Given the range of molecular weights and the differences in physical/chemical properties of the oxo-acetates it is expected that the different oxo-alkyl acetate chemicals could interact in the environment differently. The oxo-alkyl acetates range from readily biodegradable to not readily biodegradable. They are not susceptible to abiotic degradation under typical environmental conditions. However, the results of the PBT profiler classify only the oxo-tridecyl acetate (the heaviest and largest of the chemicals) as persistent. Oxo-alkyl acetates are considered mobile to relatively immobile with respect to leaching to groundwater runoff and surface water. It is noted that the solubility in water decreases by a factor of 3 from the oxo-hexyl to the oxo-tridecyl acetate with the sorption to soil increasing by a factor of 2 from the oxo-hexyl to the oxo-tridecyl acetate. Interestingly, the results of the PBT profiler indicate that the predominate media would be soil for all of the oxo-alkyl acetate chemicals. Those oxo-alkyl acetates with higher molecular weights would be expected to bioaccumulate based on physical/chemical properties; however, the results of the PBT profiler indicate a low bioaccumulation potential for all six of the oxo-alkyl acetates. Additional data would better define the environmental fate properties of this group of chemicals.

XII. Cumulative Exposure

Section 408(b)(2)(D)(v) of the FFDCA requires that, when considering whether to establish, modify, or revoke a tolerance, the Agency consider "available information" concerning the cumulative effects of a particular pesticide's residues and "other substances that have a common mechanism of toxicity." If chemicals are structurally related and all are low toxicity chemicals, then the risks either separately or combined should be low.

EPA has not made a common mechanism of toxicity finding as to the oxo-alkyl acetates and any other substances and the oxo-alkyl acetates do not appear to produce toxic metabolites

produced by other substances. For the purposes of this tolerance action, therefore, EPA has not assumed the oxo-alkyl acetates have a common mechanism of toxicity with other substances. For information regarding EPA's efforts to determine which chemicals have a common mechanism of toxicity and to evaluate the cumulative effects of such chemicals, see the policy statements released by EPA's Office of Pesticide Programs concerning common mechanism determinations and procedures for cumulating effects from substances found to have a common mechanism on EPA's website at http://www.epa.gov/pesticides/cumulative.

XIII. Conclusions

The Agency believes these chemicals to be of lower toxicity. There is a limited use pattern. The chemicals as a group are not likely to volatilize. All exposures are over-estimates. There is no reason to expect that the reasonably foreseeable uses of the oxo-alkyl acetates will constitute any significant hazard. Even considering the potential for aggregate exposures, the use of oxo-hexyl acetate (Hexanol, acetate, branched and linear, CAS Reg. No. 88230-35-7), oxo-heptyl acetate (Acetic acid, C6-8-branched alkyl esters, CAS Reg. No. 90438-79-2), oxo-octyl acetate (Acetic acid, C7-9 branched, alkyl esters, C8-rich, CAS Reg. No. 108419-32-5), oxo-nonyl acetate (Acetic acid, C8-10 branched alkyl esters, C9-rich, CAS Reg. No. 108419-33-6), oxo-decyl acetate (Acetic acid, C9-11-branched alkyl esters, C10-rich, CAS Reg. No. 108419-34-7), and/or oxo-tridecyl acetate (Acetic acid, C11-14 branched alkyl esters, C13-rich, CAS Reg. No. 108419-35-8) in a pesticide product should result in human exposure far below any dose level that could possibly produce an adverse effect.

XIV. References

EPA/OPP; EEB Review of Inert Chemicals: Oxo-alkyl Acetates (Exxate 800 and 1300); D202258; July 26, 1994 Memorandum from Anthony Maciorowski (EFED) to Sharlene Matten (EFED).

EPA/OPP; Environmental Fate and Drinking Water Assessment in Support of the Tolerance Reregistration Eligibility Decision (TRED) for Oxo-Alkyl Acetates as Inert Ingredients; D282549; November 6, 2002 Memorandum from Lucy Shanaman (EFED) to Linda Propst and Mark Perry (SRRD).

EPA/OPP; Review of Four Mutagenicity Studies Using Oxo-Alkyl Acetate (Inert Ingredient); D202263; March 21, 1995 Memorandum from David Liem (HED) to Mary Waller (RD).

EPA/OPP; Review of Additional Toxicological Data Package on Oxo-Alkyl Acetates in Support of an Inert Ingredient Clearance; D217439; August 29, 1995; Memorandum from David Liem (HED) to Mary Waller (RD).

EPA/OPP; Review of a Toxicological Data Package on Oxo-acetates in Support for a Data waiver for 90-day dog feeding study; D196447; March 30, 1995; Memorandum from David Liem (HED) to Mary Waller (RD).

Exxon Mobil Chemical Company, High Production Volume (HPV) Chemical Challenge Program Test Plan for the Alkyl Acetate C6-C13 Category; AR201-12939B; December, 2000. (posted on the EPA website: http://www.epa.gov/chemrtk/alkylace/c12939rs.pdf)

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Appendix 1: Screening-Level Exposure Assessments

for Oxo-Acetates

Dietary (Food) Exposure

DEEM Model Assumptions

- Actual crop-specific residue data for active ingredients can be utilized as surrogate data for inert ingredient residue levels (including secondary residues in meat, milk, poultry and eggs)
- Inert ingredients are used on all crops and 100% of all crops are "treated" with inert ingredients
- No adjustment made for % of inert in formulation, application rate, or multiple applications of different active ingredient formulations
- Considers only preharvest applications

Dietary modeling was performed utilizing the highest established tolerance level residue for each commodity.

Table 1. Estimated Chronic Dietary Exposure[1] for a Generic Inert Ingredient

Population Subgroup[2]	Estimated Exposure, mg/kg/day
U.S. Population (total)	0.120
All infants (< 1 year)	0.245
Children (1-2 years)	0.422
Children (3-5 years)	0.310
Children (6-12 years)	0.174
Youth (13-19 years)	0.100
Adults (20-49 years)	0.087
Adults (50+ years)	0.086
Females (13-49 years)	0.087

[1]Exposure estimates are based on highest-tolerance-level residues of high-use active ingredients for all food forms, including meat, milk, poultry, and eggs.
[2]Only representative population subgroups are shown.

Table 2. Estimated Acute Dietary Exposure[1] for a Generic Inert Ingredient			
Population Subgroup[2]	Estimated Exposure, mg/kg/day		
	95th Percentile	99th Percentile	99.9th Percentile
U.S. Population (total)	0.336	0.643	1.164
All infants (< 1 year)	0.701	1.060	2.056
Children (1-2 years)	0.939	1.382	2.106
Children (3-5 years)	0.683	1.010	1.476
Children (6-12 years)	0.395	0.563	0.827
Youth (13-19 years)	0.239	0.357	0.815
Adults (20-49 years)	0.199	0.295	0.468
Adults (50+ years)	0.191	0.263	0.357
Females (13-49 years)	0.198	0.287	0.415

[1]Exposure estimates are based on highest-tolerance-level residues of high-use active ingredients for all food forms, including meat, milk, poultry, and eggs.
[2]Only representative population subgroups are shown.

SCREENING LEVEL EXPOSURE ASSESSMENT

for Residential Use of

Oxo-Alkyl Acetates

Prepared for

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September 17, 2004

Contract Number:68-W-01-036
Work Assignment No. 0082.4000.003, Task 4-3-3

Screening-Level Exposure Assessment for Residential Use of Oxo-Alkyl Acetates (Multiple CAS Reg. Nos.)

The oxo-alkyl acetates are mixtures that include branched and linear alkyl acetates with the general structure CH_3COOR, where R is a branched alkyl group. The CAS numbers are designated for each mixture, named for the most prominent chemical in the mixture. The oxo-alkyl acetates are commercial solvents primarily used in surface coatings, but also in agricultural products.

Table 1. Physical/Chemical Properties of Oxo-Alkyl Acetates Used in Exposure Assessment

	CAS Number	Vapor Pressure	Molecular Formula	Molecular Weight*
Oxo-hexyl acetate	88230-35-7	1.5 mm Hg @ 25ºC	CH_3COOR, R is branched linear alkyl group, C6	144.21
Oxo-heptyl acetate	90438-79-2	0.5 mm Hg @ 25ºC	CH_3COOR, C6-C8 branched alkyl esters	158.24
Oxo-octyl acetate	108419-32-5	0.7 mm Hg @ 25ºC	CH_3COOR, C7-C9 branched alkyl esters, C8-rich	172.27
Oxo-nonyl acetate	108419-33-6	0.1 mm Hg @ 25ºC	CH_3COOR, C8-C10 branched alkyl esters, C9-rich	186.29
Oxo-decyl acetate	108419-34-7	0.3 mm Hg @ 25ºC	CH_3COOR, C9-C11 branched alkyl esters, C10-rich	200.32
Oxo-tridecyl acetate	108419-35-8	0.01 mm Hg @ 25ºC	CH_3COOR, C11-C14 branched alkyl esters, C13-rich	242.40

*Molecular weight is based on the primary component of the mixture.

For this exposure assessment, only one scenario is evaluated: Oxo-alkyl acetates in spray paint at 5% for both the 50th and 90th percentiles. The CEM generic scenario for *Aerosol Paint* was used, with default parameters for inhalation exposure. Dermal exposure was not assessed. A summary table of the results from the model runs for the six oxo-alkyl acetates is presented below.

Table 2. Exposure Assessment Results for Oxo-Alkyl Acetates Used in Spray Paint

	Chronic Cancer $LADD_{pot}$ (mg/kg-day)	Chronic Non-Cancer ADD_{pot} (mg/kg-day)	Acute ADR_{pot} (mg/kg-day)
Oxo-Hexyl Acetate	3.19e-03	2.18e-02	4.18e+00
Oxo-Heptyl Acetate	2.77e-03	1.89e-02	3.44e+00
Oxo-Octyl Acetate	3.02e-03	2.06e-02	3.84e+00
Oxo-Nonyl Acetate	1.66e-03	1.13e-02	2.03e+00
Oxo-Decyl Acetate	2.55e-03	1.74e-02	3.14e+00
Oxo-Tridecyl Acetate	1.19e-03	8.13e-03	8.80e-01

As can be seen from the table, the highest estimated doses (acute and chronic) correspond to oxo-hexyl acetate, and the lowest estimated doses (acute and chronic) correspond to oxo-tridecxyl acetate. There is a general trend that the estimated dose decreases as the molecular weight increases, and a better trend that the estimated dose increases as the vapor pressure increases. The outputs from the model runs for the six oxo-alkyl acetates are presented on the following pages.

References:

Chemfinder, 2004. Chemfinder Web Site: http://chemfinder.cambridgesoft.com/result.asp.

EPA Office of Pesticide Programs (OPP); Environmental Fate and Drinking Water Assessment in Support of the Tolerance Reregistration Eligibility Decision (TRED) for Oxo-Alkyl Acetates as Inert Ingredients; D282549; November 6, 2002 Memorandum from Lucy Shanaman (EFED) to Linda Propst and Mark Perry (SRRD).

Use Scenario: Oxo-Hexyl Acetate in Spray Paint

CEM Inputs		ID Number: Hexyl	
Product: Spray Paint		Chemical Name: Oxo-hexyl acetate	
Scenario: Aerosol Paint		Population: Adult	
Molecular Weight (g/mole):	144.2	Vapor Pressure (torr):	1.5
Weight Fraction - Median (unitless):	0.05	Weight Fraction - 90% (unitless):	0.05
Inhalation Inputs			
Frequency of Use (events/yr):	6	Years of Use:	11
Mass of Product Used per Event - Median (g):	227	Mass of Product Used per Event -90% (g):	738
Inhalation Rate During Use (m^3/hr):	0.55	Duration of Use - Median (hours/event):	0.333
Inhalation Rate After Use (m^3/hr):	0.55	Duration of Use - 90% (hours/event):	1
Zone 1 Volume (m^3):	20	Whole House Volume (m^3):	369
Air Exchange Rate (air exchanges/hr):	0.45	Body Weight (kg):	71.8
Portion of Aerosol in Air (unitless):	0.01		
Activity Patterns			
User:	1 1 1 1 1 1 1 2 3 5 5 4 2 4 6 7 4 2 2 7 4 4 4 1	Start Time: 9	
Non-User:	1 1 1 1 1 1 1 1 3 2 4 4 2 4 7 7 4 2 2 7 4 4 4 1	Room of Use: 5. Utility Room	
Hour:	0 6 12 18		
Dermal Inputs			
There are no Dermal inputs for this scenario.			
Avg. Time, $LADD_{pot}$, $LADC_{pot}$ (days):	2.74e+04	Avg. Time, ADD_{pot}, ADC_{pot} (days):	4.02e+03
Avg. Time, ADR_{pot}, Cp_{pot} (days):	1.00e+00		

CEM Inhalation Exposure Estimates

ID Number: Hexyl

Scenario: Aerosol Paint	Population: Adult
Inhalation Rate (m^3/day): 0.55	Years of Use (years): 11
Body Weight (kg): 71.8	Frequency of Use (events/year): 6

Exposure Units	Result	AT (days)
Chronic Cancer		
$LADD_{pot}$ (mg/kg-day)	3.19e-03	2.74e+04
$LADC_{pot}$ (mg/m^3)	1.74e-02	2.74e+04
Chronic Non-Cancer		
ADD_{pot} (mg/kg-day)	2.18e-02	4.02e+03
ADC_{pot} (mg/m^3)	1.18e-01	4.02e+03
Acute		
ADR_{pot} (mg/kg-day)	4.18e+00	1.00e+00
Cp_{pot} (mg/m^3)	3.72e+02	1.00e+00

LADD - Lifetime Average Daily Dose (mg/kg-day)	LADC - Lifetime Average Daily Concentration (mg/m^3)
ADD - Average Daily Dose (mg/kg-day)	ADC - Average Daily Concentration (mg/m^3)
ADR - Acute Dose Rate (mg/kg-day)	Cp - Peak Concentration (mg/m^3)

Note: 75 years = 2.738e+04 days pot - potential dose

Note: The general Agency guidance for assessing short-term, infrequent events (for most chemicals, an exposure of less than 24 hours that occurs no more frequently than monthly) is to treat such events as independent, acute exposures rather than as chronic exposure. Thus, estimates of long-term average exposure like ADD or ADC may not be appropriate for use in assessing risks associated with this type of exposure pattern. (Methods for Exposure-Response Analysis for Acute Inhalation Exposure to Chemicals (External Review Draft). EPA/600/R-98/051. April 1998

Use Scenario: Oxo-Heptyl Acetate in Spray Paint

CEM Inputs		ID Number: Heptyl	
Product: Spray Paint		Chemical Name: Oxo-heptyl acetate	
Scenario: Aerosol Paint		Population: Adult	
Molecular Weight (g/mole):	158.2	Vapor Pressure (torr):	0.5
Weight Fraction - Median (unitless):	0.05	Weight Fraction - 90% (unitless):	0.05
Inhalation Inputs			
Frequency of Use (events/yr):	6	Years of Use:	11
Mass of Product Used per Event - Median (g):	227	Mass of Product Used per Event -90% (g):	738
Inhalation Rate During Use (m^3/hr):	0.55	Duration of Use - Median (hours/event):	0.333
Inhalation Rate After Use (m^3/hr):	0.55	Duration of Use - 90% (hours/event):	1
Zone 1 Volume (m^3):	20	Whole House Volume (m^3):	369
Air Exchange Rate (air exchanges/hr):	0.45	Body Weight (kg):	71.8
Portion of Aerosol in Air (unitless):	0.01		
Activity Patterns			
User:	1 1 1 1 1 1 1 2 3 5 5 4 2 4 6 7 4 2 2 7 4 4 4 1	Start Time: 9	
Non-User:	1 1 1 1 1 1 1 1 3 2 4 4 2 4 7 7 4 2 2 7 4 4 4 1	Room of Use: 5. Utility Room	
Hour:	0 6 12 18		
Dermal Inputs			
There are no Dermal inputs for this scenario.			
Avg. Time, $LADD_{pot}$, $LADC_{pot}$ (days):	2.74e+04	Avg. Time, ADD_{pot}, ADC_{pot} (days):	4.02e+03
Avg. Time, ADR_{pot}, Cp_{pot} (days):	1.00e+00		

CEM Inhalation Exposure Estimates

ID Number: Heptyl

Scenario: Aerosol Paint	Population: Adult
Inhalation Rate (m^3/day): 0.55	Years of Use (years): 11
Body Weight (kg): 71.8	Frequency of Use (events/year): 6

Exposure Units	Result	AT (days)
Chronic Cancer		
$LADD_{pot}$ (mg/kg-day)	2.77e-03	2.74e+04
$LADC_{pot}$ (mg/m^3)	1.50e-02	2.74e+04
Chronic Non-Cancer		
ADD_{pot} (mg/kg-day)	1.89e-02	4.02e+03
ADC_{pot} (mg/m^3)	1.03e-01	4.02e+03
Acute		
ADR_{pot} (mg/kg-day)	3.44e+00	1.00e+00
Cp_{pot} (mg/m^3)	2.47e+02	1.00e+00

LADD - Lifetime Average Daily Dose (mg/kg-day)

LADC - Lifetime Average Daily Concentration (mg/m^3)

ADD - Average Daily Dose (mg/kg-day)

ADC - Average Daily Concentration (mg/m^3)

ADR - Acute Dose Rate (mg/kg-day)

Cp - Peak Concentration (mg/m^3)

Note: 75 years = 2.738e+04 days pot - potential dose

Note: The general Agency guidance for assessing short-term, infrequent events (for most chemicals, an exposure of less than 24 hours that occurs no more frequently than monthly) is to treat such events as independent, acute exposures rather than as chronic exposure. Thus, estimates of long-term average exposure like ADD or ADC may not be appropriate for use in assessing risks associated with this type of exposure pattern. (Methods for Exposure-Response Analysis for Acute Inhalation Exposure to Chemicals (External Review Draft). EPA/600/R-98/051. April 1998

Use Scenario: Oxo-Octyl Acetate in Spray Paint

CEM Inputs		ID Number: Octyl	
Product: Spray Paint		Chemical Name: Oxo-octyl acetate	
Scenario: Aerosol Paint		Population: Adult	
Molecular Weight (g/mole):	172.3	Vapor Pressure (torr):	0.7
Weight Fraction - Median (unitless):	0.05	Weight Fraction - 90% (unitless):	0.05
Inhalation Inputs			
Frequency of Use (events/yr):	6	Years of Use:	11
Mass of Product Used per Event - Median (g):	227	Mass of Product Used per Event -90% (g):	738
Inhalation Rate During Use (m^3/hr):	0.55	Duration of Use - Median (hours/event):	0.333
Inhalation Rate After Use (m^3/hr):	0.55	Duration of Use - 90% (hours/event):	1
Zone 1 Volume (m^3):	20	Whole House Volume (m^3):	369
Air Exchange Rate (air exchanges/hr):	0.45	Body Weight (kg):	71.8
Portion of Aerosol in Air (unitless):	0.01		
Activity Patterns			
User:	1 1 1 1 1 1 1 2 3 5 5 4 2 4 6 7 4 2 2 7 4 4 4 1	Start Time: 9	
Non-User:	1 1 1 1 1 1 1 1 3 2 4 4 2 4 7 7 4 2 2 7 4 4 4 1	Room of Use: 5. Utility Room	
Hour:	0 6 12 18		
Dermal Inputs			
There are no Dermal inputs for this scenario.			
Avg. Time, $LADD_{pot}$, $LADC_{pot}$ (days):	2.74e+04	Avg. Time, ADD_{pot}, ADC_{pot} (days):	4.02e+03
Avg. Time, ADR_{pot}, Cp_{pot} (days):	1.00e+00		

CEM Inhalation Exposure Estimates

ID Number: Octyl

Scenario: Aerosol Paint	Population: Adult
Inhalation Rate (m^3/day): 0.55	Years of Use (years): 11
Body Weight (kg): 71.8	Frequency of Use (events/year): 6

Exposure Units	Result	AT (days)
Chronic Cancer		
$LADD_{pot}$ (mg/kg-day)	3.02e-03	2.74e+04
$LADC_{pot}$ (mg/m^3)	1.64e-02	2.74e+04
Chronic Non-Cancer		
ADD_{pot} (mg/kg-day)	2.06e-02	4.02e+03
ADC_{pot} (mg/m^3)	1.12e-01	4.02e+03
Acute		
ADR_{pot} (mg/kg-day)	3.84e+00	1.00e+00
Cp_{pot} (mg/m^3)	3.04e+02	1.00e+00

LADD - Lifetime Average Daily Dose (mg/kg-day)

LADC - Lifetime Average Daily Concentration (mg/m^3)

ADD - Average Daily Dose (mg/kg-day)

ADC - Average Daily Concentration (mg/m^3)

ADR - Acute Dose Rate (mg/kg-day)

Cp - Peak Concentration (mg/m^3)

Note: 75 years = 2.738e+04 days

pot - potential dose

Note: The general Agency guidance for assessing short-term, infrequent events (for most chemicals, an exposure of less than 24 hours that occurs no more frequently than monthly) is to treat such events as independent, acute exposures rather than as chronic exposure. Thus, estimates of long-term average exposure like ADD or ADC may not be appropriate for use in assessing risks associated with this type of exposure pattern. (Methods for Exposure-Response Analysis for Acute Inhalation Exposure to Chemicals (External Review Draft). EPA/600/R-98/051. April 1998

Use Scenario: Oxo-Nonyl Acetate in Spray Paint

CEM Inputs		ID Number: Nonyl	
Product: Spray Paint		Chemical Name: Oxo-nonyl acetate	
Scenario: Aerosol Paint		Population: Adult	
Molecular Weight (g/mole):	186.3	Vapor Pressure (torr):	0.1
Weight Fraction - Median (unitless):	0.05	Weight Fraction - 90% (unitless):	0.05
Inhalation Inputs			
Frequency of Use (events/yr):	6	Years of Use:	11
Mass of Product Used per Event - Median (g):	227	Mass of Product Used per Event -90% (g):	738
Inhalation Rate During Use (m^3/hr):	0.55	Duration of Use - Median (hours/event):	0.333
Inhalation Rate After Use (m^3/hr):	0.55	Duration of Use - 90% (hours/event):	1
Zone 1 Volume (m^3):	20	Whole House Volume (m^3):	369
Air Exchange Rate (air exchanges/hr):	0.45	Body Weight (kg):	71.8
Portion of Aerosol in Air (unitless):	0.01		
Activity Patterns			
User:	1 1 1 1 1 1 1 2 3 5 5 4 2 4 6 7 4 2 2 7 4 4 4 1	Start Time: 9	
Non-User:	1 1 1 1 1 1 1 1 3 2 4 4 2 4 7 7 4 2 2 7 4 4 4 1	Room of Use: 5. Utility Room	
Hour:	0 6 12 18		
Dermal Inputs			
There are no Dermal inputs for this scenario.			
Avg. Time, $LADD_{pot}$, $LADC_{pot}$ (days):	2.74e+04	Avg. Time, ADD_{pot}, ADC_{pot} (days):	4.02e+03
Avg. Time, ADR_{pot}, Cp_{pot} (days):	1.00e+00		

CEM Inhalation Exposure Estimates

ID Number: Nonyl

Scenario: Aerosol Paint	Population: Adult
Inhalation Rate (m^3/day): 0.55	Years of Use (years): 11
Body Weight (kg): 71.8	Frequency of Use (events/year): 6

Exposure Units	Result	AT (days)
Chronic Cancer		
$LADD_{pot}$ (mg/kg-day)	1.66e-03	2.74e+04
$LADC_{pot}$ (mg/m^3)	9.00e-03	2.74e+04
Chronic Non-Cancer		
ADD_{pot} (mg/kg-day)	1.13e-02	4.02e+03
ADC_{pot} (mg/m^3)	6.14e-02	4.02e+03
Acute		
ADR_{pot} (mg/kg-day)	2.03e+00	1.00e+00
Cp_{pot} (mg/m^3)	9.34e+01	1.00e+00

LADD - Lifetime Average Daily Dose (mg/kg-day)

LADC - Lifetime Average Daily Concentration (mg/m^3)

ADD - Average Daily Dose (mg/kg-day)

ADC - Average Daily Concentration (mg/m^3)

ADR - Acute Dose Rate (mg/kg-day)

Cp - Peak Concentration (mg/m^3)

Note: 75 years = 2.738e+04 days

pot - potential dose

Note: The general Agency guidance for assessing short-term, infrequent events (for most chemicals, an exposure of less than 24 hours that occurs no more frequently than monthly) is to treat such events as independent, acute exposures rather than as chronic exposure. Thus, estimates of long-term average exposure like ADD or ADC may not be appropriate for use in assessing risks associated with this type of exposure pattern. (Methods for Exposure-Response Analysis for Acute Inhalation Exposure to Chemicals (External Review Draft). EPA/600/R-98/051. April 1998

Use Scenario: Oxo-Decyl Acetate in Spray Paint

CEM Inputs		ID Number: Decyl	
Product: Spray Paint		Chemical Name: Oxo-decyl acetate	
Scenario: Aerosol Paint		Population: Adult	
Molecular Weight (g/mole):	200.3	Vapor Pressure (torr):	0.3
Weight Fraction - Median (unitless):	0.05	Weight Fraction - 90% (unitless):	0.05
Inhalation Inputs			
Frequency of Use (events/yr):	6	Years of Use:	11
Mass of Product Used per Event - Median (g):	227	Mass of Product Used per Event -90% (g):	738
Inhalation Rate During Use (m^3/hr):	0.55	Duration of Use - Median (hours/event):	0.333
Inhalation Rate After Use (m^3/hr):	0.55	Duration of Use - 90% (hours/event):	1
Zone 1 Volume (m^3):	20	Whole House Volume (m^3):	369
Air Exchange Rate (air exchanges/hr):	0.45	Body Weight (kg):	71.8
Portion of Aerosol in Air (unitless):	0.01		
Activity Patterns			
User:	1 1 1 1 1 1 1 2 3 5 5 4 2 4 6 7 4 2 2 7 4 4 4 1	Start Time: 9	
Non-User:	1 1 1 1 1 1 1 1 3 2 4 4 2 4 7 7 4 2 2 7 4 4 4 1	Room of Use: 5. Utility Room	
Hour:	0 6 12 18		
Dermal Inputs			
There are no Dermal inputs for this scenario.			
Avg. Time, $LADD_{pot}$, $LADC_{pot}$ (days):	2.74e+04	Avg. Time, ADD_{pot}, ADC_{pot} (days):	4.02e+03
Avg. Time, ADR_{pot}, Cp_{pot} (days):	1.00e+00		

CEM Inhalation Exposure Estimates

ID Number: Decyl

Scenario: Aerosol Paint	Population: Adult
Inhalation Rate (m^3/day): 0.55	Years of Use (years): 11
Body Weight (kg): 71.8	Frequency of Use (events/year): 6

Exposure Units	Result	AT (days)
Chronic Cancer		
$LADD_{pot}$ (mg/kg-day)	2.55e-03	2.74e+04
$LADC_{pot}$ (mg/m^3)	1.39e-02	2.74e+04
Chronic Non-Cancer		
ADD_{pot} (mg/kg-day)	1.74e-02	4.02e+03
ADC_{pot} (mg/m^3)	9.47e-02	4.02e+03
Acute		
ADR_{pot} (mg/kg-day)	3.14e+00	1.00e+00
Cp_{pot} (mg/m^3)	2.11e+02	1.00e+00

LADD - Lifetime Average Daily Dose (mg/kg-day)

LADC - Lifetime Average Daily Concentration (mg/m^3)

ADD - Average Daily Dose (mg/kg-day)

ADC - Average Daily Concentration (mg/m^3)

ADR - Acute Dose Rate (mg/kg-day)

Cp - Peak Concentration (mg/m^3)

Note: 75 years = 2.738e+04 days

pot - potential dose

Note: The general Agency guidance for assessing short-term, infrequent events (for most chemicals, an exposure of less than 24 hours that occurs no more frequently than monthly) is to treat such events as independent, acute exposures rather than as chronic exposure. Thus, estimates of long-term average exposure like ADD or ADC may not be appropriate for use in assessing risks associated with this type of exposure pattern. (Methods for Exposure-Response Analysis for Acute Inhalation Exposure to Chemicals (External Review Draft). EPA/600/R-98/051. April 1998

Use Scenario: Oxo-Tridecyl Acetate in Spray Paint

CEM Inputs		ID Number: Tridecyl	
Product: Spray Paint		Chemical Name: Oxo-tridecyl acetate	
Scenario: Aerosol Paint		Population: Adult	
Molecular Weight (g/mole):	242.4	Vapor Pressure (torr):	0.01
Weight Fraction - Median (unitless):	0.05	Weight Fraction - 90% (unitless):	0.05
Inhalation Inputs			
Frequency of Use (events/yr):	6	Years of Use:	11
Mass of Product Used per Event - Median (g):	227	Mass of Product Used per Event -90% (g):	738
Inhalation Rate During Use (m^3/hr):	0.55	Duration of Use - Median (hours/event):	0.333
Inhalation Rate After Use (m^3/hr):	0.55	Duration of Use - 90% (hours/event):	1
Zone 1 Volume (m^3):	20	Whole House Volume (m^3):	369
Air Exchange Rate (air exchanges/hr):	0.45	Body Weight (kg):	71.8
Portion of Aerosol in Air (unitless):	0.01		
Activity Patterns			
User:	1 1 1 1 1 1 1 2 3 5 5 4 2 4 6 7 4 2 2 7 4 4 4 1	Start Time: 9	
Non-User:	1 1 1 1 1 1 1 1 3 2 4 4 2 4 7 7 4 2 2 7 4 4 4 1	Room of Use: 5. Utility Room	
Hour:	0 6 12 18		
Dermal Inputs			
There are no Dermal inputs for this scenario.			
Avg. Time, $LADD_{pot}$, $LADC_{pot}$ (days):	2.74e+04	Avg. Time, ADD_{pot}, ADC_{pot} (days):	4.02e+03
Avg. Time, ADR_{pot}, Cp_{pot} (days):	1.00e+00		

CEM Inhalation Exposure Estimates

ID Number: Tridecyl

Scenario: Aerosol Paint	Population: Adult
Inhalation Rate (m^3/day): 0.55	Years of Use (years): 11
Body Weight (kg): 71.8	Frequency of Use (events/year): 6

Exposure Units	Result	AT (days)
Chronic Cancer		
$LADD_{pot}$ (mg/kg-day)	1.19e-03	2.74e+04
$LADC_{pot}$ (mg/m^3)	6.49e-03	2.74e+04
Chronic Non-Cancer		
ADD_{pot} (mg/kg-day)	8.13e-03	4.02e+03
ADC_{pot} (mg/m^3)	4.42e-02	4.02e+03
Acute		
ADR_{pot} (mg/kg-day)	8.80e-01	1.00e+00
Cp_{pot} (mg/m^3)	1.71e+01	1.00e+00

LADD - Lifetime Average Daily Dose (mg/kg-day)

LADC - Lifetime Average Daily Concentration (mg/m^3)

ADD - Average Daily Dose (mg/kg-day)

ADC - Average Daily Concentration (mg/m^3)

ADR - Acute Dose Rate (mg/kg-day)

Cp - Peak Concentration (mg/m^3)

Note: 75 years = 2.738e+04 days

pot - potential dose

Note: The general Agency guidance for assessing short-term, infrequent events (for most chemicals, an exposure of less than 24 hours that occurs no more frequently than monthly) is to treat such events as independent, acute exposures rather than as chronic exposure. Thus, estimates of long-term average exposure like ADD or ADC may not be appropriate for use in assessing risks associated with this type of exposure pattern. (Methods for Exposure-Response Analysis for Acute Inhalation Exposure to Chemicals (External Review Draft). EPA/600/R-98/051. April 1998