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

OFFICE OF PREVENTION,
PESTICIDES, AND TOXIC SUBSTANCES

DATE: August 24, 2005

ACTION MEMORANDUM

SUBJECT: Inert Reassessment –n-Propanol; CAS# 71-23-8

FROM: Pauline Wagner, Chief Pauline Wagner 9/1/05
Inert Ingredient Assessment Branch
Registration Division (7505C)

TO: Lois A. Rossi, Director
Registration Division (7505C)

FQPA REASSESSMENT ACTION

Action: Reassessment of two inert exemptions from the requirement of a tolerance. The exemption is being reassessed as-is.

Chemical: n-Propanol

CFR: 40 CFR 180.910 and 40 CFR 180.930

CAS #: 71-23-8

Use Summary: Overall, the major use of n-propanol is as a solvent. In terms of pesticides, n-propanol is used as an inert ingredient only; there are no registered pesticide products containing n-propanol as an active ingredient. As an inert ingredient, n-propanol is a solvent and cosolvent in a number of pesticide products, including those used in agriculture, on animals, and on ornamental plants.

List Reclassification Determination: The current and proposed list classification is 4B.

II. MANAGEMENT CONCURRENCE

I concur with the reassessment of the two exemptions from the requirement of a tolerance for the inert ingredient n-propanol; CAS# 71-23-8, and with the List reclassification determination, as described above. I consider the two exemptions established in 40 CFR 180.910 and 40 CFR 180.930 to be reassessed for purposes of FFDCA's section 408(q) as of the date of my signature, below. A *Federal Register* Notice regarding this tolerance exemption reassessment decision will be published in the near future.

Lois A. Rossi, Director
Registration Division

September 2, 2005
Date:

pc: Debbie Edwards, SRRD
Joe Nevola, SRRD

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

OFFICE OF PREVENTION,
PESTICIDES, AND TOXIC SUBSTANCES

August 24, 2005

MEMORANDUM

SUBJECT: Reassessment of the Two Exemptions from the Requirement of Tolerances for n-Propanol

FROM: Kathleen Martin, Chemist KM 9/1/05
Inert Ingredient Assessment Branch
Registration Division (7505C)

TO: Pauline Wagner, Chief Pauline Wagner 9/1/05
Inert Ingredient Assessment Branch
Registration Division (7505C)

BACKGROUND

Attached is the science assessment for n-propanol. The purpose of this document is to reassess the two existing exemptions from the requirement of a tolerance for residues of n-propanol as required under the Food Quality Protection Act (FQPA). This assessment summarizes available information on the use, physical/ chemical properties, toxicological effects, exposure profile, and environmental fate and ecotoxicity of n-propanol.

EXECUTIVE SUMMARY

This report evaluates n-propanol, a pesticide inert ingredient for which two exemptions from the requirement of a tolerance exist for its residues when used in used in accordance with good agricultural practice as inert ingredients in pesticide formulations applied to growing crops or to raw agricultural commodities (RACs) after harvest (40 CFR 180.910) and to animals (40 CFR 180.930).

EPA expects that exposure to n-propanol is widespread, though not at high concentrations. n-Propanol occurs naturally in crude fossil fuels, as the fermentation and decomposition product of various fruits and vegetables, and is a Food and Drug Administration Direct Food Additive (as a flavoring substance). Linear saturated aliphatic alcohols such as n-propanol are ubiquitous in nature; they have been detected in almost every known fruit and vegetable (IPCS 1998). n-Propanol is among the most important industrial alcohols (Elvers, et al 1989). Overall, its major use is as a solvent, principally in printing inks, paint, cosmetics (antiseptic in soaps, lotions, and nail polishes), and pesticides (Ullman 1989; IPCS 1990).

As an inert ingredient in pesticide formulations, EPA expects that exposure to n-propanol would primarily be through the oral route, via consumption of agricultural crops to which this inert ingredient has been applied as a solvent or cosolvent and through drinking water. Additional exposure may occur in the residential setting through n-propanol's use on ornamentals such as nursery plants (trees, flowers), lawns (including golf courses), antifouling paints, and indoor and outdoor pest sprays. Residential exposure is expected primarily through the inhalation route.

n-Propanol exhibits low acute toxicity for animals via the dermal, inhalation, and oral routes of exposure; it is not very irritating to the skin and dermal absorption is expected to be slow. n-Propanol is readily metabolized, and has no evidence of carcinogenicity or mutagenicity. Finally, n-propanol is not a developmental or reproductive toxicant at levels expected from use of n-propanol as an inert ingredient in pesticide formulations.

Taking into consideration all available toxicity and exposure information on n-propanol, EPA has determined that there is a reasonable certainty that no harm to any population subgroup will result from aggregate exposure to n-propanol used as an inert ingredient in pesticide formulations when considering dietary exposure and all other nonoccupational sources of pesticide exposure for which there is reliable information. Therefore, it is recommended that the two exemptions from the requirement of a tolerance established for residues of n-propanol under 40 CFR 180.910 (one tolerance) and 40 CFR 180.930 (one tolerance) can be considered reassessed as safe under section 408(q) of the Federal Food, Drug, and Cosmetic Act (FFDCA).

I. Introduction

This report evaluates n-propanol, a pesticide inert ingredient for which two exemptions from the requirement of a tolerance exist for its residues when used in ~~used~~ in accordance with good agricultural practice as an inert ingredient in pesticide formulations applied to growing crops or to raw agricultural commodities (RACs) after harvest (40 CFR 180.910) and to animals (40 CFR 180.930). Propanol, a three-carbon alcohol, has two isomers: n-propanol which is assessed in this document, and isopropanol. Both isomers occur in nature in crude fossil fuels and as fermentation and decomposition products of various fruits and vegetables. Commercially, the principle use of n-propanol is in solvent applications. (Ullman 1989) In addition, it is used as a flavor volatile in food (IPCS 1990).

II. Use Information

A. Pesticides

n-Propanol is used as an inert ingredient only; there are no registered pesticide products containing n-propanol as an active ingredient. As an inert ingredient, n-propanol is a solvent and cosolvent in a number of pesticide products, including those used in agriculture, on animals, and on ornamental plants. The tolerance exemptions for n-propanol are provided in Table 1 below.

Table 1. Tolerance Exemptions Being Reassessed in this Document

Tolerance Exemption Expression	CAS Registration Number	40 CFR 180 §	Use Pattern (Pesticidal)
n-Propanol	71-23-8	.910[a]	Solvent, cosolvent
		.930[b]	Solvent, for blended emulsifiers

[a]Residues listed in 40 CFR 180.910 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 or to RACs after harvest.

[b]Residues listed in 40 CFR 180.930 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 animals.

B. Other Uses

The propanol isomers are mainly used as solvents for coatings; in antifreeze compositions and household personal products; and as chemical intermediates for the production of esters, amines, and other organic derivatives. Overall, the major use of n-propanol is as a solvent. In 1988, over 75% of the n-propanol used in the United States was in this sector. (Ullman 1989) As a solvent, n-propanol is used principally in printing inks, paint, cosmetics (antiseptic in soaps, lotions, and nail polishes), and pesticides (Ullman 1989; IPCS 1990).

In addition to its industrial uses, n-propanol is added to foods and beverages as a flavor volatile (IPCS 1990); there is one U.S. Food and Drug Administration (FDA) Direct Food Additive for n-propanol (see Table 2).

Table 2. Food Additives Permitted For Direct Addition To Food For Human Consumption

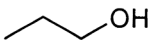
Name	21 CFR §	Use Pattern
[a]Propyl alcohol; 1-propanol	172.515	Synthetic flavoring substances and adjuvants

[a]To be used in the minimum quantity required to produce their intended effect.

III. Physical and Chemical Properties

Some of the physical and chemical characteristics of n-propanol, along with its structure and nomenclature, are found in Table 3.

Table 3. Physical and Chemical Properties of n-Propanol

Parameter	Value	Reference
Structure		
CAS #	71-23-8	
Empirical Formula	C_3H_8O	
Molecular Weight	60.1	
Common Names	1-Propyl alcohol; Ethyl carbinol; Propyl alcohol; Propanol; Propanol-1; n-Propyl alcohol	NIH 2004a
Physical State	Clear colorless liquid, with characteristic odor	NIOSH 1999
Melting Point	-127°C	
Boiling Point	97°C	
Relative Density (water=1)	0.8	
Relative Vapor Density (air=1)	2.1	
Log P_{ow}	0.25	
Vapor Pressure at 20°C	2.0 kPa (15 mm Hg)	
Water Solubility at 25°C	$1x10^6$	U.S. EPA 2002
Henry's Law Constant at 25°C	7.41×10^{-6} atm-m^3/mole	

IV. Hazard Assessment

To assess the toxicity posed by the use of n-propanol as an inert ingredient in pesticide formulations, the Environmental Protection Agency (EPA or the Agency) relied on a 1990 peer-reviewed document: the International Programme on Chemical Safety (IPCS) Environmental Health Criteria (EHC) on n-propanol (IPCS 1990)[1]. The Agency also considered a draft European Union Comprehensive Risk Assessment (FIOSHNU 2003).

n-Propanol is sponsored under the Agency's High Production Volume (HPV) Challenge Program[2]. Member countries of the Organization for Economic Cooperation and Development (OECD) are sharing the burden of investigating the chemicals identified under the HPV program. Germany is sponsoring the development of the Screening Information Data Set (SIDS), which will be used to set priorities for further testing or risk assessment/management activities. Currently, n-propanol is in the "Information Gathering & Data Review" stage (http://cs3-hq.oecd.org/scripts/hpv/).

A. Toxicological Data

Provided in Table 4 are the acute toxicity data for n-propanol. The other available toxicity data are described below.

Acute Toxicity

Table 4. Summary of Acute Toxicity Data n-Propanol

Parameter	Toxicity and 40 CFR 156.62 Toxicity Category	Reference
Oral LD_{50}	n-Propanol exhibits low acute oral toxicity, except in very young rats. Oral LD_{50} values for several animal species range between 1,870 and 6,800 mg/kg body weight. The principal toxic effect following a single exposure is depression of the central nervous system. *Toxicity Category III or IV*	IPCS 1990
Dermal LD_{50}	Rabbit LD_{50} 4,000 mg/kg to 6,700 mg/kg *Toxicity Category III*	Lington and Bevan 1991
Inhalation LC_{50}	Mouse LC_{50} 48,000 mg/m^3 (20,000 ppm or 48 mg/L) *Toxicity Category IV*	Lewis 2000

[1]IPCS is a joint venture of the United Nations Environment Programme, the International Labour Organisation, and the World Health Organization. Their EHC monographs represent a thorough evaluation of a chemical's risks.

[2]HPV chemicals are those that are manufactured or imported into the United States in volumes greater than one million pounds per year. The goal of the HPV program is to collect and make publicly-available a complete set of baseline health and environmental effects data on such chemicals. Industry sponsors volunteer to evaluate the adequacy of existing data and to conduct tests where needed to fill the gaps in the data, and EPA (and the public) has an opportunity to review and comment on the sponsors' robust summary report.

Table 4. Summary of Acute Toxicity Data n-Propanol

Parameter	Toxicity and 40 CFR 156.62 Toxicity Category	Reference
Skin Irritation	When 500 mg of n-propanol was applied to the skin of rabbits (with no covering), mild effects were observed (well-defined erythema and slight edema).	Lewis 2000
Eye Irritation	n-Propanol is moderately irritating to the eyes of rabbits.	Lington and Bevan 1991

Subchronic Toxicity

Limited subchronic data available. IPCS (1990) reports the results of a study where three male and three female rats of unspecified strain were exposed to four daily oral doses of 2,160 mg undiluted n-propanol; no deaths occurred and no gross pathological signs were seen in the liver. Lington and Bevan (1991) describe a study where 60.1 g/L n-propanol in drinking water was given to male rats for four months; no effects were observed in body weight, food consumption, or liver pathology.

Mutagenicity

n-Propanol has not shown mutagenic potential. In bacterial assays, n-propanol was shown to be negative for point mutations. In the Ames Test without S9 activation, up to 100 μmol/plate was negative with *Salmonella typhimurium* TA-100. TA-100 and TA-98 with or without metabolic activation was also reported to be negative. In a reverse mutation assay with *Escherchia coli* CA-274 (following a pre-incubation protocol), a five-fold increase in the number of revertants was observed at a concentration of 4.5% n-propanol; no metabolic activation system was used. (IPCS 1990)

In assays using *in vitro* mammalian cells, n-propanol did not increase the incidence of sister chromatid exchange (SCE) or micronuclei. Cells tested for SCE included Chinese hamster ovary cells (100 mg/L once a day for seven days), V79 Chinese hamster lung fibroblasts (6,000 mg/L for three hours, with activation), and V79 Chinese hamster lung fibroblasts (6,000 mg/L for 28 hours, without activation). n-Propanol did not increase the number of micronuclei in V79 Chinese hamster lung fibroblasts at 40,200 mg/L for one hour. (IPCS 1990)

Carcinogenicity

There are no reliable carcinogenicity data available for n-propanol. Looking at the carcinogenicity of a structurally-similar alcohol—ethanol—EPA does not expect that n-propanol would be carcinogenic. In an Agency review (U.S. EPA 1995), EPA stated "that carcinogenic effects are not expected from the uses of ethanol."

Developmental and Reproductive Effects

In an inhalation study (Nelson, et al 1985), two sets of rats (one set of *pregnant* females and one set of males) were each exposed to n-propanol at 0; 3,500; or 7,000 ppm (0; 8.6; or 17 mg/L) for 7 hours/day. The females were exposed on gestation days 0 to 7 and the males were exposed for six weeks. After a two-day nonexposure delay, the exposed males were mated with a set of unexposed virgin females; this was done to study the effects of n-propanol on male fertility.

The study showed effects on the adults from the 7,000 ppm dose group. In males, fertility was reduced—this is based on the observation that even though 17 out of 18 males copulated, the pregnancy rate was low (two out of 17, verified by examination of the uterus upon sacrifice). Pregnant females showed reduced weight gain (their female offspring also showed reduced weight gain through three weeks of age; in addition, these offspring had crooked tails). No effects were noted in males or females of the 3,500 ppm group. On postnatal day 10, pups from both the paternally- and maternally-exposed groups were assessed for behavioral effects; no differences were noted from controls for both male or female offspring.

In a second inhalation study conducted by Nelson et al (1988) and described by Lington and Bevan (1991), pregnant female rats were exposed to 0; 3,500; 7,000; or 10,000 ppm (0, 8.6, 17, or 26 mg/L) of n-propanol on days 1 to 19 of gestation. Throughout gestation, food consumption was significantly reduced in the 7,000 and 10,000 ppm groups; maternal body weight was affected only at the end of gestation in the 10,000 ppm group. Resorptions were increased in the 10,000 ppm group and fetal body weights were significantly reduced in the 7,000 and 10,000 ppm groups. Significantly more litters had malformations following exposure to the 7,000 and 10,000 ppm doses; no effects were seen at 3,500 ppm.

To summarize Nelson et al (1985, 1988), investigators observed no maternal or fetal effects at 3,500 ppm (8.6 mg/L) n-propanol; maternal and fetal effects were seen at 7,000 and 10,000 ppm (17 and 26 mg/L).

In an oral study, investigators studied the effects of n-propanol on brain development in the neonatal rat. A group of five-day-old rats was dosed with n-propanol in artificial milk via gavage. Over the course of four days (postnatal days five through eight), the rats received 12 feeds daily, each lasting 20 minutes. Daily doses were 3,800; 7,500; 3,000; or 7,800 mg/kg body weight. During exposure, the exposed pups frequently showed an impaired righting response; after the last exposure, withdrawal symptoms were displayed. Pups were sacrificed at 18 days of age; there was no effect on body weight or on absolute weight of the kidneys, heart, or liver. However, the absolute and

relative brain weights were decreased in the exposed pups. Biochemical analysis showed that the exposed pups had a decreased amount of DNA in all brain areas examined. Cholesterol levels were decreased in the forebrain and cerebellar samples, while protein levels were decreased only in the forebrain samples. (IPCS 1990; Grant and Samson 1983)

B. Metabolism and Pharmacokinetics

n-Propanol is rapidly absorbed and distributed throughout the body following ingestion (IPCS 1990). Oral administration of 3 g/kg to Wistar rats resulted in a maximum blood concentration of 1,860 mg/L n-propanol in 90 minutes (Lington and Bevan 1991). Dermal absorption is expected to be slow. n-Propanol is metabolized by alcohol dehydrogenase (ADH) to propionic acid via the aldehyde and may enter the tricarboxylic acid cycle. (IPCS 1990)

C. Special Considerations for Infants and Children

n-Propanol is of low toxicity for human health effects endpoints (including developmental and reproductive effects) based on the available information. For developmental effects, Nelson et al (1985, 1988) noted in two separate inhalation studies that no effects were observed at 3,500 ppm, which is considered to be a very high dose. Also, the effects seen in the offspring were at levels where effects were also seen in the adults. Based on this information, a safety factor analysis has not been used to assess the risks resulting from the use of n-propanol; therefore, an additional tenfold safety factor for the protection of infants and children is unnecessary.

V. Environmental Fate Characterization and Drinking Water Considerations

The Office of Pesticide Programs Environmental Fate and Effects Division (EFED) has reviewed (U.S. EPA 2002) the fate and environmental effects of the aliphatic alcohols by reviewing the available data and considering Structure Activity Relationships (SAR). As a group, the C1 through C4 alcohols, which includes n-propanol, are very highly water soluble and very mobile in terrestrial and aquatic environments, moving mainly with the water phase to surface and groundwater. Volatility from soil (vapor pressure, 15 mm Hg) and water (Henry's Law Constant of 7.41×10^{-6}) and microbially-mediated degradation are expected to limit transport to surface and ground water from applications or releases to land, with biodegradation being the major route of environmental degradation. Transformation and/or degradation via hydrolysis and direct soil and water photolysis is not an important pathway. Fugacity modeling predicts approximately 50% of releases will be associated with the water phase and 40% with soils. Predicted dissipation half-lives range from 2.5 to 3.5 days in rivers and from 30 to 40 days in lakes. These data suggest that n-propanol is not persistent in the environment.

n-Propanol may contaminate shallow aquifer groundwater; however, biologically-mediated degradation in both aerobic and anaerobic conditions will limit loadings, thus concentrations. Based on the high volatility of most aliphatic alcohols and aeration sequences used in many drinking water utilities, it is unlikely that most of these compounds will be found in treated water at concentrations equivalent to those found naturally in the environment. (U.S. EPA 2002) IPCS (1990) reports that n-propanol has been found in urban drinking water at a concentration of 0.001 ppm. Other available ambient water monitoring data indicate that many short chain aliphatic alcohols are found in surface water in the low- to mid-ppb range (U.S. EPA 2002). There are no ambient water quality criteria or drinking water maximum contaminant or health advisory levels for any of the aliphatic alcohols.

VI. Exposure Assessment

Individuals may be exposed to n-propanol through the oral, dermal, and inhalation routes of exposure. EPA expects that exposure to n-propanol is widespread. According to Elvers et al (1989), n-propanol is among the most important industrial alcohols. Overall, the major use is as a solvent, principally in printing inks, paint, cosmetics (antiseptic in soaps, lotions, and nail polishes), and pesticides (Ullman 1989; IPCS 1990).

When used as a pesticide inert ingredient, EPA expects that exposure to n-propanol would primarily be through the oral route, via consumption of agricultural crops to which this inert ingredient has been applied as a solvent or cosolvent and through drinking water. Additional exposure may occur in the residential setting from use of pesticide products containing n-propanol on ornamentals such as nursery plants (trees, flowers), lawns (including golf courses), antifouling paints, and indoor and outdoor pest sprays. Residential exposure is expected primarily through the inhalation route.

Food and Drinking Water

As an inert ingredient of pesticide products that are applied to growing crops, RACs after harvest, or to animals, potential human exposure would be via the oral route, through consumption of food to which an n-propanol-containing pesticide product has been applied, or through drinking water. EPA expects that such exposures would be low. n-Propanol is readily biodegradable, so it is unlikely that residues would be found on foods harvested and consumed, or in drinking water (see section on "Environmental Fate Characterization and Drinking Water Considerations" for details).

n-Propanol does occur naturally as a fermentation and decomposition product of various fruits and vegetables. Linear saturated aliphatic alcohols, which include n-propanol, are ubiquitous in nature; they have been detected in almost every known fruit and vegetable (IPCS 1998). Alcoholic beverages nearly always contain n-propanol—beer may contain it up to 195 ppm, wine up to 116 ppm, and neat ethanol up to 2,910 ppm (IPCS 1990).

In addition to its natural occurrence, FDA permits n-propanol to be added to food as a synthetic flavoring substance "in the minimum quantity required to produce their intended effect" (21 CFR 172.515). And JECFA, the Joint World Health Organization (WHO)/Food And Agriculture Organization (FAO) Expert Committee on Food Additives, has evaluated the use of n-propanol as an extraction solvent, carrier solvent, and flavoring agent (IPCS 2001).

Residential

n-Propanol is used as an inert ingredient in a number of consumer products such as; antifouling paint, pesticide sprays sold for use in and around the home (bug killers, treatment for ornamental plants), and flea and tick sprays for cats and dogs. In addition, exposure may occur through n-propanol's inert use in pesticide products applied to golf courses and nursery plants. Although residential exposure can occur through the dermal and inhalation routes, EPA only expects inhalation exposure—dermal exposure is not expected as dermal absorption is expected to be slow.

Limited residential exposure data are available for n-propanol. The Household Products Database (NIH 2004b) shows two products which contain n-propanol; both are liquid varnishes with an unknown amount of n-propanol. To estimate *worst-case* inhalation exposure, EPA modeled a scenario using E-FAST (U.S. EPA 2004c) where a residential aerosol indoor-use paint product contained 90% n-propanol and was sprayed for 20 minutes in an enclosed utility room.

E-FAST is a model used by EPA's Office of Pollution, Prevention and Toxics to conduct New Chemicals exposure assessments. It was developed to provide screening-level estimates of the concentrations of chemicals released from consumer products. Modeled estimates of concentrations and doses are designed to reasonably overestimate exposures, for use in screening level assessment. In using E-FAST to model exposure, the assessor may choose from the following Consumer Pathway scenarios: General Purpose Cleaner, Latex Paint, Fabric Protector, Aerosol Paint, Laundry Detergent, Solid Air Freshener, Bar Soap, and Used Motor Oil. For this assessment, the "Aerosol Paint" scenario was used.

Using E-FAST (U.S. EPA 2004c) and standard model assumptions (model results and all assumptions are provided in Appendix A), EPA determined that the chronic indoor potential Average Daily Concentration (which is an exposure metric for inhalation exposure) of n-propanol is 2.2 mg/m^3 or 0.9 ppm. This E-FAST estimate is considered worst-case for several reasons: (1) in the E-FAST run, a high concentration of n-propanol (90%) was assumed; it is unlikely that all indoor residential-use products containing n-propanol as an inert ingredient have such a high concentration; (2) E-FAST is designed as a screening tool with modeled estimates of concentrations and doses designed to reasonably overestimate exposures; and (3) the E-FAST scenario that would yield the greatest exposure (aerosol paint) was used. For outdoor-use products,

EPA believes that exposure would be no greater than for indoor use and, in fact, is expected to be much less due to n-propanol's dissipation into the air.

Aggregate Exposures

In examining aggregate exposure, the Federal Food, Drug, and Cosmetic Act (FFDCA) section 408 directs EPA to consider available information concerning exposures from the pesticide residue in food and all other nonoccupational exposures, including drinking water from ground water or surface water and exposure through pesticide use in gardens, lawns, or buildings (residential and other indoor uses).

For n-propanol, a qualitative assessment for all pathways of human exposure (food, drinking water, and residential) is appropriate given the lack of human health concerns associated with exposure to n-propanol as an inert ingredient in pesticide formulations.

Cumulative Exposure

Section 408(b)(2)(D)(v) of 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."

Unlike other pesticides for which EPA has followed a cumulative risk approach based on a common mechanism of toxicity, EPA has not made a common mechanism of toxicity finding as to n-propanol and any other substances and, n-propanol does not appear to produce a toxic metabolite produced by other substances. For the purposes of this tolerance action, therefore, EPA has not assumed that n-propanol has 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/.

IX. Human Health Risk Characterization

Taking into consideration all available toxicity and exposure information on n-propanol, EPA has determined that there is a reasonable certainty that no harm to any population subgroup will result from aggregate exposure to n-propanol used as an inert ingredient in pesticide formulations when considering dietary exposure and all other nonoccupational sources of pesticide exposure for which there is reliable information.

IPCS (1990) considers it unlikely that n-propanol will pose a serious health risk for the general population under normal exposure conditions. n-Propanol exhibits low acute toxicity for animals via the dermal, inhalation, and oral routes of exposure. Lington and Bevan (1991) point out that it is not very irritating to the skin and dermal absorption is expected to be slow. n-Propanol is readily metabolized, and has no evidence of carcinogenicity or mutagenicity. Finally, n-propanol is not a developmental or reproductive toxicant at levels expected from use of n-propanol as an inert ingredient in pesticide formulations. Nelson et al (1985) determined that, via the inhalation route, a dose of 3,500 ppm over several days of gestation produced no maternal or offspring effects; these results were confirmed in a second inhalation study (Nelson et al 1988). Overall exposure due to the inert use of n-propanol is expected to result in human exposure below any dose level that would produce any adverse effect. n-Propanol is readily biodegradable so it is unlikely that residues would be found on foods harvested and consumed or in drinking water. Further, FDA permits n-propanol to be added deliberately to foods as a flavoring substance and adjuvant. Specific limits are not stipulated, though the regulation permitting this use (40 CFR 172.515) does state that synthetic flavoring substances and adjuvants "used in food in the minimum quantity required to produce their intended effect...." JECFA has evaluated the use of n-propanol as an extraction solvent, carrier solvent, and flavoring agent . They reported that there is no "safety concern at current levels of intake when used as a flavouring agent" (IPCS 2001). Finally, worst-case residential exposure, which was estimated via the inhalation route, is 0.9 ppm. Nelson et al (1985, 1988) observed no reproductive or developmental effects when rats were exposed (via the inhalation route) to n-propanol at doses up to 3,500 ppm during gestation days 1 to 19.

Thus, based on n-propanol's low toxicity and low exposure, it is recommended that the two exemptions from the requirement of a tolerance established for residues of n-propanol under 40 CFR 180.910 (one tolerance) and 40 CFR 180.930 (one tolerance) can be considered reassessed as safe under section 408(q) of FFDCA.

X. Ecotoxicity and Ecological Risk Characterization

EFED finds that based on their ecotoxicity estimates, n-propanol is practically nontoxic on an acute basis, both to aquatic species and animals. For freshwater and marine/estuarine fish, *Daphnia magna*, mysid shrimp, and green algae estimated acute toxicity is greater than 100 mg/L. Terrestrial animal acute toxicity based on available rat data show that n-propanol is practically nontoxic. Chronic toxicity for fish is estimated to be from 70 mg/L to >100 mg/L. (U.S. EPA 2002)

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APPENDIX A: E-FAST Results for n-Propanol

CEM Inputs

ID Number: 1-Prop

Product: indoor spray paint		Chemical Name: 1-propanol	
Scenario: Aerosol Paint		Population: Adult	
Molecular Weight (g/mole):	60.1	Vapor Pressure (torr):	15
Weight Fraction - Median (unitless):	0.9	Weight Fraction - 90% (unitless):	0.9

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: 1-Prop

Product: indoor spray paint

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)	5.83e-02	2.74e+04
$LADC_{pot}$ (mg/m^3)	3.17e-01	2.74e+04
Chronic Non-Cancer		
ADD_{pot} (mg/kg-day)	3.98e-01	4.02e+03
ADC_{pot} (mg/m^3)	2.16e+00	4.02e+03
Acute		
ADR_{pot} (mg/kg-day)	7.82e+01	1.00e+00
Cp_{pot} (mg/m^3)	7.82e+03	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