SCREENING-LEVEL HAZARD CHARACTERIZATION

Palmitic acid, 2-ethylhexyl ester
(CASRN 29806-73-3)

The High Production Volume (HPV) Challenge Program[1] was conceived as a voluntary initiative aimed at developing and making publicly available screening-level health and environmental effects information on chemicals manufactured in or imported into the United States in quantities greater than one million pounds per year. In the Challenge Program, producers and importers of HPV chemicals voluntarily sponsored chemicals; sponsorship entailed the identification and initial assessment of the adequacy of existing toxicity data/information, conducting new testing if adequate data did not exist, and making both new and existing data and information available to the public. Each complete data submission contains data on 18 internationally agreed to "SIDS" (Screening Information Data Set[1,2]) endpoints that are screening-level indicators of potential hazards (toxicity) for humans or the environment.

The Environmental Protection Agency's Office of Pollution Prevention and Toxics (OPPT) is evaluating the data submitted in the HPV Challenge Program on approximately 1400 sponsored chemicals by developing hazard characterizations (HCs). These HCs consist of an evaluation of the quality and completeness of the data set provided in the Challenge Program submissions. They are not intended to be definitive statements regarding the possibility of unreasonable risk of injury to health or the environment.

The evaluation is performed according to established EPA guidance[2,3] and is based primarily on hazard data provided by sponsors; however, in preparing the hazard characterization, EPA considered its own comments and public comments on the original submission as well as the sponsor's responses to comments and revisions made to the submission. In order to determine whether any new hazard information was developed since the time of the HPV submission, a search of the following databases was made from one year prior to the date of the HPV Challenge submission to the present: (ChemID to locate available data sources including Medline/PubMed, Toxline, HSDB, IRIS, NTP, ATSDR, IARC, EXTOXNET, EPA SRS, etc.), STN/CAS online databases (Registry file for locators, ChemAbs for toxicology data, RTECS, Merck, etc.) and Science Direct. OPPT's focus on these specific sources is based on their being of high quality, highly relevant to hazard characterization, and publicly available.

OPPT does not develop HCs for those HPV chemicals which have already been assessed internationally through the HPV program of the Organization for Economic Cooperation and Development (OECD) and for which Screening Initial Data Set (SIDS) Initial Assessment Reports (SIAR) and SIDS Initial Assessment Profiles (SIAP) are available. These documents are presented in an international forum that involves review and endorsement by governmental authorities around the world. OPPT is an active participant in these meetings and accepts these documents as reliable screening-level hazard assessments.

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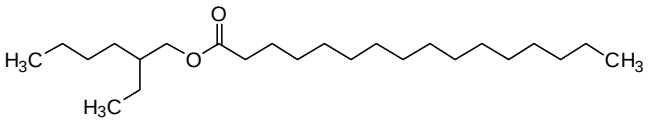
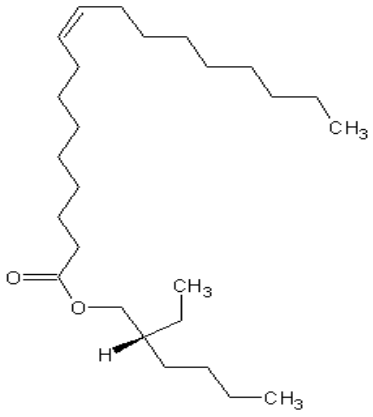
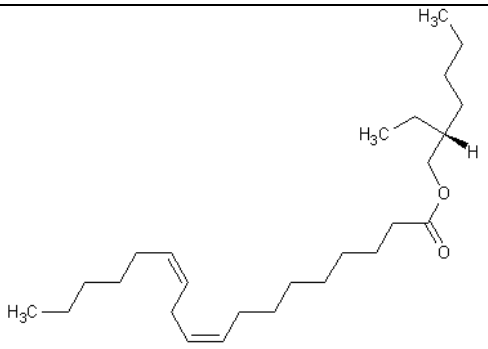
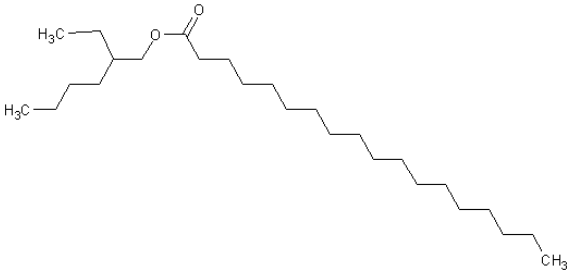
[1] U.S. EPA. High Production Volume (HPV) Challenge Program; http://www.epa.gov/chemrtk/index.htm.
[2] U.S. EPA. HPV Challenge Program – Information Sources; http://www.epa.gov/chemrtk/pubs/general/guidocs.htm.
[3] U.S. EPA. Risk Assessment Guidelines; http://cfpub.epa.gov/ncea/raf/rafguid.cfm.

These hazard characterizations are technical documents intended to inform subsequent decisions and actions by OPPT. Accordingly, the documents are not written with the goal of informing the general public. However, they do provide a vehicle for public access to a concise assessment of the raw technical data on HPV chemicals and provide information previously not readily available to the public.

Chemical Abstract Service Registry Number (CASRN)	**Sponsored Chemical** **29806-73-3** **Supporting Chemical** **68334-13-4** **85049-37-2**
Chemical Abstract Index Name	**Sponsored Chemical** **Hexadecanoic acid, 2-ethylhexyl ester** **Supporting Chemicals** **Fatty acids, tall-oil, 2-ethylhexyl esters** **Fatty acids, C16 – 18 and C18-unsaturated, 2-ethylhexyl esters**
Structural Formula	**Sponsored Chemical**  **Supporting Chemicals** 



Representative structures



Representative structure

Summary

CASRN 29806-73-3 is a clear colorless liquid with negligible water solubility and moderate vapor pressure. It is expected to have low mobility in soil. Volatilization is considered high based on its Henry's Law constant; however, adsorption to suspended solids and sediment is expected to attenuate the rate of volatilization. The rate of hydrolysis is considered negligible. The rate of atmospheric photooxidation is considered moderate. CASRN 29806-73-3 is expected to be readily biodegradable and have low persistence (P1) and low bioaccumulation potential (B1).

The acute oral toxicity of CASRN 29806-73-3 is low in rats. There are no repeated-dose, reproductive, developmental, gene mutation or chromosomal aberration studies available.

For CASRN 29806-73-3, no adequate aquatic toxicity data were available; however, there are no acute or chronic effects at saturation expected for fish, aquatic invertebrates and aquatic plants based on its physical-chemical properties.

Repeated dose, reproductive, and developmental toxicity, and gene mutations and chromosomal aberrations testing are identified as data gaps under the HPV Challenge Program.

The sponsor, the American Chemistry Council (ACC) Aliphatic Esters Panel, submitted a Test Plan and Robust Summaries to EPA for the aliphatic monoesters category on November 26, 2003. EPA posted the submission on the ChemRTK HPV Challenge website on February 19, 2004 (http://www.epa.gov/chemrtk/pubs/summaries/alipestr/c13466tc.htm). EPA comments on the original submission were posted to the website on March 1, 2006. Public comments were also received and posted to the website. The HallStar Company submitted a revised test plan and robust summaries on March 25, 2010 that proposed a single chemical submission for palmitic acid, 2-ethylhexyl ester (CASRN 29806-73-3; 9th CI name: hexadecanoic acid, 2-ethylhexyl ester), which had previously been part of the aliphatic monoesters category.

Justification for Supporting Chemicals

The sponsor proposed using seven other aliphatic monoesters as supporting chemicals for palmitic acid, 2-ethylhexyl ester (CASRN 29806-73-3): fatty acids, tall oil, 2-ethylhexyl esters (CASRN 68334-13-4); butyl stearate (CASRN 123-95-5); 2-ethylhexyl esters of C16 – 18 saturated and C18-unsaturated fatty acids (CASRN 85049-37-2); octyl stearate, (CASRN 109-36-4); decyl oleate (CASRN 3687-46-5); myristyl stearate (CASRN 17661-50-6) and isocetyl stearate (CASRN 25339-09-7). The supporting chemicals range in carbon number from C22 to C34. The sponsor proposed using test data from these substances to characterize palmitic acid, 2-ethylhexyl ester.

The sponsor stated that the supporting chemical, fatty acids, tall oil, 2-ethylhexyl esters, is composed mainly of 2-ethylhexyl esters of oleic and linoleic acid, but did not give a more detailed composition of the mixture. It is known that fatty acids obtained from the distillation of tall oils may contain other fatty acids (i.e., C16 fatty acids) and resin acids. In its original comments, EPA indicated that a more detailed description of the substance was needed in order to verify that the 2-ethylhexyl esters of oleic and linoleic acid are the predominant components. In its March 2010 submission, the sponsor did not provide this more detailed description.

The sponsor's rationale was based on their conclusion that the supporting chemicals shared chemical and structural similarities with palmitic acid, 2-ethylhexyl ester, which were expected to result in similar physicochemical, environmental fate and toxicological properties. EPA determined that for human health purposes, the proposed supporting chemicals CASRNs 68334-13-4 and 85049-37-2 were appropriate to use for read across, but that the other proposed supporting chemicals were not appropriate to use for read across. Both the sponsored chemical CASRN 29806-73-3 and the supporting chemicals CASRNs 68334-13-4 and 85049-37-2 are 2-ethylhexyl esters and are expected to be metabolized to 2-ethylhexanoic acid. There were no reliable human health data provided for CASRN 85049-37-2; therefore, only data from CASRN 68334-13-4 can be used for read across.

For aquatic toxicity, the supporting chemical, 2-ethylhexyl esters of C16 – 18 saturated and C18 unsaturated fatty acids (CASRN 85049-37-2), was not used to address aquatic toxicity endpoints because testing was conducted above the chemical's water solubility limit and critical details are missing from the test summaries.

1. Chemical Identity

1.1 Identification and Purity

The following description is taken from the 2010 Test Plan and Robust Summary. Palmitic acid 2-ethylhexyl ester is an alkyl fatty acid ester. Test substance purity was not specified in the Robust Summary.

1.2 Physical-Chemical Properties

The physical-chemical properties of the sponsored chemical CASRN 29806-73-3 are summarized in Table 1. CASRN 29806-73-3 is a colorless liquid with negligible water solubility and moderate vapor pressure.

Table 1. Physical-Chemical Properties of CASRN 29806-73-3[1]

	Sponsored Chemical
Property	**Hexadecanoic acid, 2-ethylhexyl ester**
CASRN	29806-73-3
Molecular Weight	368.64
Physical State	Liquid, clear and colorless[1]
Melting Point	-1°C (measured)[1]
Boiling Point	>300°C (estimated)[2]
Vapor Pressure	2.0×10^{-3} mm Hg at 25°C (measured)[1]
Water Solubility	8.2×10^{-6} mg/L at 25°C (estimated)[2]
Dissociation Constant (pK_a)	Not applicable
Henry's Law Constant	0.19 atm-m^3/mole (estimated)[2]
Log K_{ow}	10.6 (estimated)[2]

[1] American Chemistry Council, The HallStar Company. January 20, 2010. Revised Robust Summary and Test Plan for Palmitic Acid 2-Ethylhexyl Ester. Available online from: http://www.epa.gov/chemrtk/pubs/summaries/alipestr/c13466tc.htm as of May 19, 2010.
[2] U.S. EPA. 2010. Estimation Programs Interface Suite™ for Microsoft® Windows, v4.00. U.S. Environmental Protection Agency, Washington, DC, USA. Available online from: http://www.epa.gov/opptintr/exposure/pubs/episuitedl.htm as of May 19, 2010.

2. General Information on Exposure

2.1 Production Volume and Use Pattern

According to the 2006 IUR submissions, CASRN 29806-73-3 had an aggregated production and/or import volume(s) in the United States between 1 and 10 million pounds.

Industrial processing and uses for the chemical were claimed confidential. Non-confidential commercial and consumer uses of this chemical include not readily obtainable (NRO).

2.2 Environmental Exposure and Fate

The environmental fate properties are provided in Table 2. CASRN 29806-73-3 is expected to have low mobility in soil. A structurally similar mixture, fatty acids, C16-18 and C18-unsaturated, 2-ethylhexyl esters (CASRN 85049-37-2), was readily biodegradable using the closed bottle test under OECD test guideline (OECD TG 301D) under aerobic conditions using inoculum from activated sludge. Biodegradation was determined (85% in 28 days) by analyzing the biological oxygen demand and oxygen uptake. Volatilization is considered high based on the Henry's Law constant; however, adsorption to suspended solids and sediment is expected to attenuate the rate of volatilization. The rate of hydrolysis is expected to be negligible under environmental pH and temperature. CASRN 29806-73-3 is expected to have low persistence (P1) and low bioaccumulation potential (B1).

Table 2. Environmental Fate Characteristics of CASRN 29806-73-3[1]

	Sponsored Chemical
Property	**Hexadecanoic acid, 2-ethylhexyl ester**
CASRN	29806-73-3
Photodegradation Half-life	4.3 hours (estimated)[1]
Hydrolysis Half-life	14.1 years at pH 7 and 1.4 years at pH 8 (estimated)[1]
Biodegradation	85% biodegradation in 28 days (readily biodegradable)[2,3,4]
Bioaccumulation Factor	BAF = 126 (estimated)[1]
Log K_{oc}	5.9 (estimated)[1]
Fugacity (Level III Model)[1]	
Air (%)	0.9
Water (%)	25.1
Soil (%)	73.7
Sediment (%)	0.3
Persistence[5]	P1 (low)
Bioaccumulation[5]	B1 (low)

[1] U.S. EPA. 2010. Estimation Programs Interface Suite™ for Microsoft® Windows, v4.00. U.S. Environmental Protection Agency, Washington, DC, USA. Available online from: http://www.epa.gov/opptintr/exposure/pubs/episuitedl.htm as of April 19, 2010.

[2] American Chemistry Council, The HallStar Company. January 20, 2010. Revised Robust Summary and Test Plan for Palmitic acid 2-ethylhexyl ester. Available online from: http://www.epa.gov/chemrtk/pubs/summaries/alipestr/c13466tc.htm as of May 19, 2010.

[3] American Chemistry Council, Aliphatic Esters Panel. November 26, 2003. Revised Robust Summary and Test Plan for the Monoesters Category of the Aliphatic Esters Category. Available online from: http://www.epa.gov/chemrtk/pubs/summaries/alipestr/c13466tc.htm as of May 19, 2010.

[4] Biodegradation data from fatty acids, C16-18 and C18-unsaturated, 2-ethylhexyl esters (CASRN: 85049-37-2) were used to support biodegradation of the sponsored chemical.

3. Human Health Hazard

The human health data are summarized in Table 3.

Acute Oral Toxicity

Palmitic acid, 2-ethylhexyl ester (CASRN 29806-73-3)
Wistar rats (10 males/dose) were administered a single dose of palmitic acid, 2-ethylhexyl ester via gavage at 5000 mg/kg and observed for 14 days. One rat died on day 1.
LD_{50} (males) > 5000 mg/kg

Fatty acids, tall oil, 2-ethylhexyl ester (CASRN 68334-13-4, supporting chemical)
Rats (5/dose, strain unspecified, animals were said to be distributed equally by sex) were administered fatty acids, tall oil, 2-ethylhexyl ester via gavage at ~2000, 4000, 8000, 16,000, 32,000 or 64,000 mg/kg and observed for 14 days. No deaths occurred.
LD_{50} > ~ 64,000 mg/kg

Repeated-Dose Toxicity

No data are available.

Reproductive Toxicity

No data are available.

Developmental Toxicity

No data are available.

Genetic Toxicity – Gene Mutation

No data are available.

Genetic Toxicity – Chromosomal Aberrations

No data are available.

Conclusion: The acute oral toxicity of CASRN 29806-73-3 in rats is low. There were no repeated dose, reproductive, developmental, gene mutation or chromosomal aberration studies available.

Table 3. Summary Table of the Screening Information Data Set as Submitted under the U.S. HPV Challenge Program: Human Health Data	
Endpoints	**Palmitic acid, 2-ethylhexyl ester (29806-73-3)**
Acute Oral Toxicity LD_{50} (mg/kg)	**> 5000**
Repeated-Dose Toxicity NOAEL/LOAEL (mg/kg-day)	Data gap
Reproductive Toxicity NOAEL/LOAEL (mg/kg-day)	Data gap
Developmental Toxicity NOAEL/LOAEL (mg/kg-day)	Data gap
Genetic Toxicity – Gene Mutation *In vitro*	Data gap
Genetic Toxicity – Chromosomal Aberrations	Data gap

Measured data in bold text

4. Hazard to the Environment

The environmental hazard data are summarized in Table 4.

Acute Toxicity to Fish and Aquatic Invertebrates and Toxicity to Aquatic Plants

No adequate aquatic toxicity data were available for palmitic acid, 2-ethylhexyl ester (CASRN 29806-73-3). However, based on the physical-chemical properties of this chemical, including the predicted water solubility limit of 8.2×10^{-6} mg/L and predicted high log Kow, there are no acute or chronic effects at saturation expected for CASRN 29806-73-3. Therefore, no further testing of this chemical is needed.

Conclusion: For CASRN 29806-73-3, no adequate aquatic toxicity data were available; however, there are no acute or chronic effects at saturation expected for fish, aquatic invertebrates and aquatic plants based on its physical-chemical properties.

Table 4. Summary Table of the Screening Information Data Set as Submitted under the U.S. HPV Challenge Program: Aquatic Toxicity Data

Endpoints	Palmitic acid, 2-ethylhexyl ester (29806-73-3)
Fish 96-h LC_{50} (mg/L)	NES
Aquatic Invertebrates 48-h EC_{50} (mg/L)	NES
Aquatic Plants 72-h EC_{50} (mg/L)	NES
Aquatic Invertebrates, Chronic (mg/L)	NES

NES = No effects expected at saturation (water solubility limit)