

SCREENING-LEVEL HAZARD CHARACTERIZATION

SPONSORED CHEMICAL

Chlorendic Anhydride (CASRN 115-27-5)

SUPPORTING CHEMICAL

Chlorendic acid (CASRN 115-28-6)

The High Production Volume (HPV) Challenge Program¹ 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, EXTTOXNET, 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

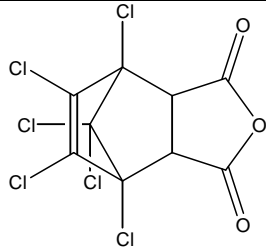
¹ U.S. EPA. High Production Volume (HPV) Challenge Program; <http://www.epa.gov/chemrtk/index.htm>.

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>.

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.

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.

<p>Chemical Abstract Registry Number (CASRN)</p>	<p>CASRN 115-27-5</p>
<p>Chemical Abstract Index Name</p>	<p>4,7-Methanoisobenzofuran-1,3-dione, 4,5,6,7,8,8-hexachloro-3a,4,7,7a-tetrahydro-</p>
<p>Structural Formula</p>	 <p>The image shows the chemical structure of 4,7-Methanoisobenzofuran-1,3-dione, 4,5,6,7,8,8-hexachloro-3a,4,7,7a-tetrahydro-. It consists of a benzene ring fused to a five-membered ring containing a methylene bridge and a dione group. Six chlorine atoms are attached to the benzene ring at positions 4, 5, 6, 7, 8, and 8.</p>
<p style="text-align: center;">Summary</p> <p>Chlorendic anhydride (CASRN 115-27-5) is a white crystalline solid with moderate vapor pressure, as evidenced by sublimation beginning at 160 °C. Volatilization from water is negligible since CASRN 115-27-5 hydrolyzes rapidly to chlorendic acid (CASRN 115-28-6), which has negligible vapor pressure and moderate to high water solubility. Mobility in soil is expected to be moderate. The rate of atmospheric photooxidation is considered moderate. This chemical is expected to have low persistence (P1) and low bioaccumulation potential (B1).</p> <p>Acute oral toxicity of chlorendic anhydride in rats and acute dermal toxicity in rabbits is low. Repeated oral exposure of rats to chlorendic anhydride for 90-days showed mortalities in 3/15 females and decreased body weight (> 10%) at 202 mg/kg-day; the NOAEL for systemic toxicity was 39 mg/kg-day. A reproductive toxicity study was not submitted; however, no treatment-related effects on reproductive organs were noted in the 90-day repeated-dose toxicity study. An oral prenatal developmental toxicity study showed an increased number of post-implantation losses at 100 mg/kg-day; the NOAEL for developmental toxicity was 25 mg/kg-day. Maternal toxicity, evidenced by decreased body weight gain, occurred at 400 mg/kg-day; the NOAEL for maternal toxicity was 100 mg/kg-day. This chemical did not induce gene mutations or chromosomal aberrations <i>in vitro</i>.</p> <p>The measured 96-hour LC₅₀ of CASRN 115-28-6 to fish is 422.7 mg/L, the measured 48-hour EC₅₀ to aquatic invertebrates is 110.7 mg/L, and the measured 96-hour EC₅₀ to aquatic plants is > 97.2 mg/L (biomass/growth).</p> <p>No data gaps were identified for the purposes of the HPV Challenge Program.</p>	

The sponsor, The sponsor, Velsicol Chemical Corporation, submitted a Test Plan and Robust Summaries to EPA for chlorendic anhydride (CASRN 115-27-5; 9th CI name: 4,7-methanoisobenzofuran-1,3-dione,4,5,6,7,8,8-hexachloro-3a,4,7,7a-tetrahydro-) on December, 27, 2001. EPA posted the submission on the ChemRTK HPV Challenge website on February, 20, 2002 (<http://www.epa.gov/oppt/chemrtk/pubs/summaries/chlranhd/c13465tc.htm>). EPA comments on the original submission were posted to the website on September, 19, 2002. Public comments were also received and posted to the website.

Justification for Supporting Chemical

The sponsor submitted physical-chemical properties and environmental fate data for chlorendic acid (CASRN 115-28-6), the corresponding dicarboxylic acid of chlorendic anhydride (CASRN 115-27-5). Chlorendic anhydride hydrolyzes immediately to chlorendic acid; therefore, it is reasonable to use this compound as a supporting chemical for the sponsored substance. EPA agreed to use of the supporting chemical data under HPV.

1 Chemical Identity

1.1 Identification and Purity

The sponsor's Test Plan does not discuss the chemical identity or purity. The Robust Summaries state that chlorendic anhydride is a white crystalline solid and the purity ranges from 93-100%.

1.2 Physical-Chemical Properties

The physical-chemical properties of chlorendic anhydride are summarized in Table 1. Chlorendic anhydride is a white crystalline solid with moderate vapor pressure, as evidenced by sublimation beginning at 160 °C. Chlorendic anhydride hydrolyzes immediately to chlorendic acid which has negligible vapor pressure and moderate to high water solubility.

Property	Chlorendic Anhydride	Chlorendic Acid
CASRN	115-27-5	115-28-6
Molecular Weight	370.83	388.85
Physical State	White crystalline solid	Solid
Melting Point	233°C (measured) ²	209°C (measured) ² 239 – 242 °C (measured) ⁴
Boiling Point	266.5–322°C (measured)	433°C (estimated) ³
Vapor Pressure	0.015 mm Hg at 25°C (estimated) Sublimes between 160 – 235 °C ⁵	3×10 ⁻⁸ mm Hg at 25°C (estimated)
Water Solubility	Hydrolyzes immediately to chlorendic acid; 0.0982 mg/L (estimated)	454–508 mg/L at 20 °C (measured) ⁷ 3500 mg/L at 25°C ⁴
Dissociation Constant (pK _a)	Not applicable	3.1 (measured) ²
Henry's Law Constant	8.8×10 ⁻⁸ atm·m ³ /mole (estimated)	3×10 ⁻¹⁴ atm·m ³ /mole (estimated)
Log K _{ow}	Hydrolyzes immediately to chlorendic acid; 4.37 (estimated)	1.39 (measured)

¹Velsicol Chemical Corporation. January 6, 2002. Test Plan and Robust Summary for Chlorendic Anhydride. <http://www.epa.gov/chemrtk/pubs/summaries/chlranhd/c13465tc.htm>.

²SRC. The Physical Properties Database (PHYSPROP). Syracuse, NY: Syracuse Research Corporation. Available from <http://www.syrres.com/esc/physprop.htm> as of October 15, 2008.

³U.S. EPA. 2008. Estimation Programs Interface Suite™ for Microsoft® Windows, v 3.20. United States Environmental Protection Agency, Washington, DC, USA. <http://www.epa.gov/opptintr/exposure/pubs/episuite.htm>.

⁴Manual for PRTR Release Estimation Methods Part III page 241 Japanese Ministry of the Environment 2004

⁵Velsicol Information sheet 115-27-5 <http://velsicol.com/Documentation/ChlAnh-Tech.pdf>

2 General Information on Exposure

2.1 Production Volume and Use Pattern

CASRN 115-27-5 had an aggregated production and/or import volume in the United States during calendar year 2005 between 1 million and 10 million pounds.

Non-confidential information in the IUR⁴ indicated that the industrial processing and uses of the chemical include flame retardants in the manufacturing of paint, coating, resin and synthetic rubber. Non-confidential information in the IUR indicated that the commercial and consumer products containing the chemical include “paints and coatings” and “rubber and plastic products.” Information from the Hazardous Substances Data Bank (HSDB) for this chemical indicates that the chemical is primarily used as a flame retardant in unsaturated polyester resins, a chemical intermediate for chlorendic acid, a hardener for epoxy resins, and polymers for building materials, paints and other coatings.⁵

2.2 Environmental Exposure and Fate

No quantitative information is available on releases of this chemical to the environment. The environmental fate properties are provided in Table 2.

Chlorendic anhydride is expected to have moderate mobility in soil. Chlorendic anhydride hydrolyzes immediately to chlorendic acid, therefore volatilization is negligible since chlorendic acid exists as an anion under environmental conditions. Chlorendic anhydride (or its hydrolysis product chlorendic acid) was not readily biodegradable using a manometric respirometry (OECD 301F) test. Chlorendic anhydride is expected to have low persistence (P1) and low bioaccumulation potential (B1).

⁴ USEPA, 2006. Inventory Update Reporting Database. v1.02.

⁵ HSDB, 2008. Hazardous Substances Data Bank. Accessed, 12/30/08. <http://toxnet.nlm.nih.gov/>

Table 2. Environmental Fate Characteristics of Chlorendic Anhydride and Chlorendic Acid¹		
Property	Chlorendic Anhydride	Chlorendic Acid
CASRN	115-27-5	115-28-6
Photodegradation Half-life	23 hours (estimated)	15.7 hours (estimated)
Hydrolysis Half-life	Hydrolyzes immediately to chlorendic acid	Stable
Biodegradation	2.4% in 31 days (not readily biodegradable)	2.4% in 31 days (not readily biodegradable); 0% in 14 days (not readily biodegradable) ²
Bioconcentration	BCF = 460 (estimated) ³	BCF = <0.22 (measured in carp) ² ; BCF = <2.1 (measured in carp) ²
Log K _{oc}	2.5 (estimated) ³	3.4 (estimated) ³
Fugacity (Level III Model)	Air = 100% Water = <0.1% Soil = <0.1% Sediment = <0.1%	Air = <0.1% Water = 42.9% Soil = 57.0% Sediment = 0.096%
Persistence ⁴	P1 (low)	P2 (moderate)
Bioaccumulation ⁴	B1 (low)	B1 (low)
<p>¹Velsicol Chemical Corporation. January 6, 2002. Test Plan and Robust Summary for Chlorendic Anhydride. http://www.epa.gov/chemrtk/pubs/summaries/chlranhd/c13465tc.htm.</p> <p>²National Institute of Technology and Evaluation. 2002. Biodegradation and Bioaccumulation of the Existing Chemical Substances under the Chemical Substances Control Law. http://www.safe.nite.go.jp/english/kizon/KIZON_start_hazkizon.html.</p> <p>³U.S. EPA. 2008. Estimation Programs Interface Suite™ for Microsoft® Windows, v 3.20. United States Environmental Protection Agency, Washington, DC, USA.</p> <p>⁴Federal Register. 1999. Category for Persistent, Bioaccumulative, and Toxic New Chemical Substances. <i>Federal Register</i> 64, Number 213 (November 4, 1999) pp. 60194–60204.</p>		

Conclusion: Chlorendic anhydride is a white crystalline solid with moderate vapor pressure, as evidenced by sublimation beginning at 160 °C. Chlorendic anhydride hydrolyzes immediately to chlorendic acid which has negligible vapor pressure and moderate to high water solubility. Mobility in soil is expected to be moderate. Volatilization from water is negligible since chlorendic anhydride hydrolyzes rapidly to chlorendic acid, which exists as an anion under environmental conditions. The rate of atmospheric photooxidation is considered moderate. Chlorendic anhydride is expected to have low persistence (P1) and low bioaccumulation potential (B1).

3 Human Health Hazard

Acute Oral Toxicity

A summary of health effects data submitted for SIDS endpoints is provided in Table 3.

Chlorendic anhydride (CASRN 115-27-5)

Charles River CD rats (5/sex/group) were administered chlorendic anhydride via gavage at 807.1, 1281, 2034, 3229 or 5126 mg/kg-bw in corn oil and observed for up to 14 days after dosing. Mortality was observed in the three highest dose groups in each sex. Rats died on day 1- 5 (2034 mg/kg-bw, 2 females; 3229 mg/kg-bw, 5 males and 5 females; 5126 mg/kg-bw, 5 males and 5 females).

LD₅₀ = 2336 mg/kg-bw

Acute Dermal Toxicity

Chlorendic anhydride (CASRN 115-27-5)

New Zealand White rabbits (2/sex/group) were administered chlorendic anhydride via the dermal route at 10,000 or 20,000 mg/kg-bw to clipped, abraded skin under occluded conditions for 24 hours and were observed for 14 days following exposure. Both male rabbits at the 20,000 mg/kg-bw dosage level died during the observation period and were subsequently necropsied. The test substance was irritating to rabbit skin as evidenced by redness, swelling and skin peeling at both test concentrations.

10,000 < LD₅₀ < 20,000 mg/kg-bw

Repeated-Dose Toxicity

Chlorendic anhydride (CASRN 115-27-5)

Charles River CD rats (15/sex/group) were administered chlorendic anhydride via the diet at 0, 100, 500 or 2500 ppm (approximately 0, 8, 39, or 202 mg/kg-bw/day in males and 0, 8, 45, or 226 mg/kg-bw/day in females) for 90 days. At terminal sacrifice, elected tissues were weighed and samples from 10 males and females of the control and high-dose animals were prepared for microscopic examination. Ophthalmic examinations were conducted on all rats once during the pretest period and again after 90 days of exposure. Blood and urine samples were collected (5 rats/sex/group) at 1, 2 and 3 months for measurement of hematologic and chemistry variables. There were no overt signs of clinical toxicity. Three high-dose females died between the fifth and thirteenth week of the study. Mid- and high-dose males and all three groups of treated females had decreased group mean body weights compared with controls; respective mean percentage decreases in body weight were 7.6 and 12.4% in the male groups and 3.9, 5.6 and 21.4% in the female groups. Decreased food consumption compared with controls, was only observed in high-dose females. No consistent exposure-related effects were found in the ophthalmologic, hematologic, clinical chemistry or urine analytic examinations, with the exception that serum alkaline phosphatase (AP) activities were significantly higher in high-dose females at 1, 2 and 3 months of study, compared with controls. However, the robust summary did not specify the magnitude of these changes. Statistically significant ($p < 0.05$) decreases in the mean absolute weights of hearts of male rats at the 2500 ppm dose level and in the mean absolute and relative weights of livers of male and female rats ($p < 0.01$) at all dose levels,

appeared to be treatment-related. The robust summary did not indicate the magnitude of the organ weight changes, therefore the biological significance of these changes cannot be determined. No compound-related gross or microscopic lesions were seen in the treatment groups, compared with controls.

LOAEL = 202 mg/kg-bw/day (based on mortalities in 3/15 females, and > 10% decreased body weight)

NOAEL = 39 mg/kg-bw/day

Reproductive Toxicity

Chlorendic anhydride (CASRN 115-27-5)

In the 90-day oral, repeated-dose oral toxicity study in rats described previously, no effects on reproductive organs were observed at any dose level.

The lack of effects on reproductive organs in the 90-day repeated dose study of rats is supported by the finding that there was no male reproductive toxicity in a mouse dominant lethal assay. Male CD-1 mice (10/group) were administered chlorendic anhydride via gavage at doses of 0, 0.05, 0.1, 0.5 or 5 mg/kg-bw in DMSO and mated (2 days after dose administration) with unexposed virgin females (two per male) for 5 days. This mating schedule was repeated with new females for an additional 6 weeks (7 weekly mating sessions). Mated females were killed approximately 14 days after the midpoint of each mating period and assessed for dead and living implants and total implantations to assess induction of dominant lethal mutations. The robust summary reported that no evidence for compound-induced dominant lethal mutations was found.

Developmental Toxicity

Chlorendic anhydride (CASRN 115-27-5)

Pregnant Charles River CD rats (25/group) were administered chlorendic anhydride via gavage at doses of 0, 25, 100 or 400 mg/kg-bw/day in corn oil on gestation days 6 – 19. Dams were sacrificed on gestation day 20, and fetuses were removed and prepared for examination. Endpoints examined included number and location of viable and nonviable fetuses, early and late resorptions, total implantations and corpora lutea, and sex and body weight of fetuses. One third of fetuses were sectioned for examination of visceral malformations and the remaining fetuses were stained for skeletal malformations and variations. No animals died during the study period. High-dose dams showed reduced mean body weight gains compared with controls and there was an increased incidence of rats showing matted fur, anogenital staining and red nasal discharge. The magnitude of the observed decreases in body weight gain was not reported in the robust summary. No statistically significant ($p < 0.05$) differences between exposed and control groups were found in the mean number of corpora lutea, viable fetuses, nonviable fetuses or mean fetal body weights. A statistically significant ($p < 0.05$) increase in the mean number of post-implantation losses compared with control occurred at 100 and 400 mg/kg-bw/day. The robust summary did not report the magnitude of these changes, stating only that “this increase is slightly higher than (sic) the mean for the historical control”. A few malformed fetuses (nature of malformations unspecified) were found in the exposed groups (none in control). One, two, and one malformed fetuses were reported in the 25, 100 and 400 mg/kg-bw/day groups, respectively;

however, no statistically significant ($p < 0.05$) differences between exposed and control groups were found. Fetal variations were reported to be similar between all groups.

LOAEL (maternal toxicity) = 400 mg/kg-bw/day (based on decreased body weight gain)

NOAEL (maternal toxicity) = 100 mg/kg-bw/day

LOAEL (developmental toxicity) = 100 mg/kg-bw/day (based on increased number of post-implantation losses)

NOAEL (developmental toxicity) = 25 mg/kg-bw/day

Genetic Toxicity – Gene Mutation

In vitro

Chlorendic anhydride (CASRN 115-27-5)

In a back mutation assay *Salmonella typhimurium* strains TA1535, TA1537, TA1538, TA98 and TA100 and *Saccharomyces cerevisiae* strain D4 were exposed to chlorendic anhydride at concentrations of 0, 0.1, 1.0, 10, 100 or 500 $\mu\text{g}/\text{plate}$ with and without metabolic activation (liver preparations from Aroclor-induced rats). Positive and negative controls were included, but the robust summary did not indicate whether the positive controls produced an appropriate response. Results in the absence and in the presence of metabolic activation were reported as negative. The robust summary noted that the highest concentrations produced “quantitative or qualitative evidence of some chemically-induced physiological effects”, but otherwise did not specify cytotoxic concentrations.

Chlorendic anhydride was not mutagenic in this assay.

Genetic Toxicity – Chromosomal Aberrations

In vitro

Chlorendic anhydride (CASRN 115-27-5)

Mouse lymphoma L5178Y cells were exposed to chlorendic anhydride at concentrations of 0, 0.06, 0.08, 0.12, 0.16 or 0.24 mg/mL without metabolic activation (mouse liver preparations) during trial one, 0, 0.08, 0.12, 0.16, 0.24 or 0.32 mg/mL with metabolic activation during trial one and 0, 0.24, 0.32, 0.40, 0.48, 0.56 or 0.64 mg/mL with activation during trial two, and evaluated for forward mutations at the thymidine kinase (TK) locus. Positive and negative controls were used and positive controls produced an appropriate response. Cytotoxic responses were observed at 0.24 mg/L without activation and at concentrations > 0.32 mg/L with activation. Increased frequencies of mutations at the TK locus were not found in the exposed cells, compared with negative controls. To fulfill the SIDS endpoint, it is acceptable to substitute a mouse lymphoma assay to assess base level chromosome mutagenicity, if the assay is conducted with evaluation of colony sizing. The presence of small colonies in this assay is indicative of chromosome mutations, whereas large colonies are indicative of gene mutations. Since this test reports no increase in mutant colonies (at a range of concentrations up to a level that caused 50% reduction in cell survival), the size of the colonies, though not specified, is not relevant in this case.

Chlorendic anhydride was not mutagenic in this assay.

In vivo

Chlorendic anhydride (CASRN 115-27-5)

Although not an adequate substitute for a chromosome aberration assay to fulfill the SIDS endpoint, the rodent dominant lethal assay (described above in Reproductive Toxicity) supports the finding of no mutagenic response in mammalian cells. In a mouse dominant lethal assay, CD-1 mice showed no evidence for compound-induced dominant lethal mutations.

Chlorendic anhydride did not induce dominant lethal mutations in this assay.

Conclusion: Acute oral toxicity of chlorendic anhydride in rats and acute dermal toxicity in rabbits is low. Repeated oral exposure of rats to chlorendic anhydride for 90-days showed mortalities in 3/15 females and decreased body weight (> 10%) at 202 mg/kg-day; the NOAEL for systemic toxicity was 39 mg/kg-day. A reproductive toxicity study was not submitted; however, no treatment-related effects on reproductive organs were noted in the 90-day repeated-dose toxicity study. An oral, prenatal developmental toxicity study showed an increased number of post-implantation losses at 100 mg/kg-day; the NOAEL for developmental toxicity was 25 mg/kg-day. Maternal toxicity, evidenced by decreased body weight gain, occurred at 400 mg/kg-day; the NOAEL for maternal toxicity was 100 mg/kg-day. This chemical did not induce gene mutations or chromosomal aberrations *in vitro*.

No data gaps were identified for the purposes of the HPV Challenge Program.

4 Hazards to the Environment

A summary of aquatic toxicity data submitted for SIDS endpoints is provided in Table 2.

Acute Toxicity to Fish

(1) Rainbow trout (*Salmo gairdneri*) were exposed to chlorendic anhydride at nominal concentrations of 0 (control), 100, 180, 320, 560 or 1000 mg/L under static conditions for 96 hours. Measured concentrations were not provided. No mortality was observed at 100, 180 or 320 mg/L, while 100% mortality was observed at 560 and 1000 mg/L.

96-h LC₅₀ = 422.7 mg/L

(2) Bluegill sunfish (*Lepomis macrochirus*) were exposed to chlorendic anhydride at nominal concentrations of 0 (control), 100, 180, 320, 560 or 1000 mg/L under static conditions for 96 hours. Measured concentrations were not provided. No mortality was observed at 100, 180 or 320 mg/L, while 100% mortality was observed at 560 and 1000 mg/L.

96-h LC₅₀ = 422.7 mg/L

Acute Toxicity to Aquatic Invertebrates

Water fleas (*Daphnia magna*) were exposed to chlorendic anhydride at nominal concentrations of 0, 18, 32, 56, 100 or 180 mg/L under static conditions for 48 hours. Measured concentrations were not provided. For the control through high concentration groups, 48-hour mortality percentages were 0, 0, 0, 0, 35 and 100%, for the 0, 18, 32, 56, 100 and 180 mg/L groups, respectively.

48-h EC₅₀ = 110.7 mg/L

Toxicity to Aquatic Plants

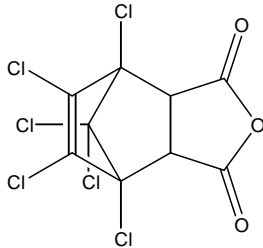
Green algae (*Pseudokirchneriella subcapitata*) were exposed to chlorendic anhydride at nominal concentrations of 0, 6.25, 12.5, 25, 50 or 100 mg/L under static conditions for 72 hours. Mean measured concentrations were 0, 6.57, 13.2, 25.3, 48.4 and 97.2 mg/L. No inhibition in algal growth was observed.

72-h EC₅₀ (biomass) > 97.2 mg/L

72-h EC₅₀ (growth) > 97.2 mg/L

Conclusion: The measured 96-hour LC₅₀ of CASRN 115-28-6 to fish is 422.7 mg/L, the measured 48-hour EC₅₀ to aquatic invertebrates is 110.7 mg/L, and the measured 96-hour EC₅₀ to aquatic plants is > 97.2 mg/L (biomass/growth).

Table 3

Summary Table of the Screening Information Data Set as Submitted under the U.S. HPV Challenge Program	
Endpoints	SPONSORED CHEMICAL Chlorendic anhydride (CASRN 115-27-5)
Structure	
Summary of Human Health Data	
Acute Oral Toxicity LD₅₀ (mg/kg-bw)	2336
Acute Dermal Toxicity LD₅₀ (mg/kg-bw)	10,000 < LD₅₀ < 20,000
Repeated-Dose Toxicity NOAEL/LOAEL Oral (mg/kg-bw/day)	NOAEL = 39 LOAEL = 202
Reproductive Toxicity NOAEL/LOAEL Oral (mg/kg-bw/day)	No effects were seen following evaluation of reproductive organs in a 90-day oral repeated-dose toxicity study in rats.
Developmental Toxicity NOAEL/LOAL Oral (mg/kg-bw/day) Maternal Toxicity Developmental Toxicity	NOAEL = 100 LOAEL = 400 NOAEL = 25 LOAEL = 100
Genetic Toxicity – Gene Mutation <i>In vitro</i>	Negative
Genetic Toxicity – Chromosomal Aberrations <i>In vitro</i>	Negative
Summary of Environmental Effects – Aquatic Toxicity Data	
Fish 96-h LC₅₀ (mg/L)	422.7
Aquatic Invertebrates 48-h EC₅₀ (mg/L)	110.7
Aquatic Plants 72-h EC₅₀ (mg/L) (growth) (biomass)	> 97.2 > 97.2