SCREENING-LEVEL HAZARD CHARACTERIZATION

SPONSORED CHEMICAL
Triisopropylborate (CASRN 5419-55-6)

SUPPORTING CHEMICALS
Isopropanol (CASRN 67-63-0)
Boric acid (CASRN 10043-35-3)

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.

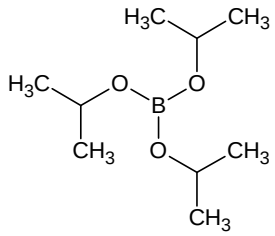
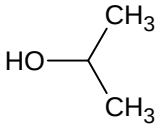
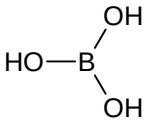
The evaluation is performed according to established EPA guidance[2,3] and is based primarily on hazard data provided by sponsors; however, in preparing the hazard characterization, EPA considered its own comments and public comments on the original submission as well as the sponsor's responses to comments 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

[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.

Chemical Abstract Service Registry Number (CASRN)	**Sponsored Chemical** **5419-55-6** **Supporting Chemicals** **67-63-0** **10043-35-3**
Chemical Abstract Index Name	**Sponsored chemical** **Boric acid (H_3BO_3), tris(1-methylethyl) ester** **Supporting Chemicals** **2-Propanol** **Boric acid (H_3BO_3)**
Structural Formula	**Sponsored Chemical**  **Supporting Chemicals**  **2-Propanol**  **Boric acid (H_3BO_3)**

Summary

CASRN 5419-55-6 is a liquid with high vapor pressure. It has a high estimated water solubility and it undergoes rapid hydrolysis to form isopropanol (CASRN 67-63-0) and boric acid (CASRN 10043-35-3). It is expected to have moderate mobility in soil. The rate of volatilization of CASRN 5419-55-6 from water and moist soil is considered moderate based on its estimated Henry's Law constant; however, the rapid rate of hydrolysis will make this environmental fate process irrelevant. The rate of atmospheric photooxidation is considered moderate. CASRN 5419-55-6 is expected to have low persistence (P1) and low bioaccumulation potential (B1).

Acute oral toxicity of CASRN 5419-55-6 to rats is low. CASRN 5419-55-6 is not irritating to

Guinea pig skin and rabbit eyes. It is not a dermal sensitizer in Guinea pigs.

Several repeated-dose, reproductive, and developmental toxicity studies in multiple species have been conducted with supporting chemicals CASRN 10043-35-3 (boric acid) and CASRN 67-63-0 (isopropanol).

In repeated oral-exposure, sub-chronic (13 weeks) and chronic (104 weeks) studies of rats, mice and dogs with CASRN 10043-35-3, the most sensitive and primary target organ was testes. Decreased absolute and relative testes weight, testicular atrophy, decreased spermatogenesis, and effects on thyroid, spleen and liver were seen at a lowest LOAEL of 21.8 mg/kg-bw/day (calculated as mg of Boron) among these studies. In reproductive toxicity studies, the reported testicular effects include decreased absolute and relative (to body weight) testes weight, testicular atrophy, degeneration of the spermatogenic epithelium, impaired spermatogenesis, reduced fertility and sterility. The lowest LOAEL among these studies was 26.6 mg/kg-bw/day (calculated as Boron). In several developmental toxicity studies, the reported developmental effects include high prenatal mortality; decreased fetal body weight, malformations and variations of the eyes, CNS, cardiovascular system, and axial skeleton. Increased incidences of short rib XIII and wavy rib, and a decreased incidence of rudimentary extra rib on lumbar I were the most common anomalies in both rats and mice with LOAEL values of 13.3 mg/kg-bw/day and 79 mg/kg-bw/day, respectively. Cardiovascular malformations, especially inter-ventricular septal defect, and variations were the frequent anomalies in rabbits with a LOAEL of 47.7 mg/kg-bw/day. CASRN 10043-35-3 did not induce gene mutation or chromosomal aberrations.

CASRN 67-63-0 showed low acute oral and inhalation toxicity in rats and low acute dermal toxicity in rabbits. It is not irritating to rabbit skin; however, it is irritating to rabbit eyes. CASRN 67-63-0 is not a skin sensitizer in Guinea pigs. The target organ following repeated inhalation exposure to CASRN 67-63-0 in rats (13 weeks) and mice (18 months) was the kidney. Rats exhibited male specific chronic progressive nephropathy with a LOAEC of approximately12.3 mg/L/day (5000 ppm). Mice showed renal tubular proteinosis and tubular dilation with a LOAEC of approximately 6.1 mg/L/day (2500 ppm). In a two-generation reproductive study via gavage, the only reproductive parameter apparently affected by CASRN 67-63-0 exposure was a statistically significant decrease in male mating index of the F_1 males;the NOAEL was 100 mg/kg/day. The developmental toxicity studies showed a NOAEL of 400 mg/kg/day for rats and 480 mg/kg/day for rabbits. The developmental neurotoxicity study did not show any neurotoxicity with a NOAEL of 1200 mg/kg-bw/day. CASRN 67-63-0 did not induce gene mutation in *in vitro* tests and did not induce chromosomal aberrations in *in vivo* test. CASRN 67-63-0 did not show an increase in the tumor incidence in rats or mice.

The acute aquatic toxicity values of CASRN 5419-55-6, based on its hydrolysis products (CASRNs 10043-35-3 and 67-63-0), for fish, aquatic invertebrates, and aquatic plants are >100 mg/L. The 21-day EC_{50} for aquatic invertebrates for CASRN 10043-35-3 is 52.2 mg/L.

No data gaps were identified under the HPV Challenge Program.

The sponsor, E.I. du Pont de Nemours & Company, Inc., submitted a Test Plan and Robust Summaries to EPA for triisopropylborate (CASRN 5419-55-6) on November 10, 2003. EPA posted the submission on the ChemRTK HPV Challenge website on December 17, 2003 (http://www.epa.gov/oppt/chemrtk/pubs/summaries/triprobt/c14841tc.htm). EPA comments on the original submission were posted to the website on April 26, 2004. Public comments were also received and posted to the website. The sponsor submitted updated/revised documents on March 10, 2008 and March 18, 2008, which were posted to the ChemRTK website on May 5, 2008 and May 6, 2008, respectively.

Justification for Supporting Chemicals

Triisopropylborate undergoes rapid hydrolysis (half–life less than 15 minutes) to form isopropanol and boric acid. EPA agrees that isopropanol and boric acid can be used to address aquatic, repeated-dose, developmental, and reproductive toxicity.

1. Chemical Identity

1.1 Identification and Purity

The Test Plan indicated purity of the test substance to be greater than 99% (2008).

1.2 Physical-Chemical Properties

The physical-chemical properties of triisopropylborate and the supporting chemicals are summarized in Table 1.

Triisopropylborate is a liquid with high vapor pressure. It has high estimated water solubility and it undergoes rapid hydrolysis to form isopropanol and boric acid.

Table 1. Physical-Chemical Properties of Triisopropylborate[1]			
	Sponsored Chemical	**Supporting Chemicals**	
Property	**Triisopropylborate**	**Isopropanol**	**Boric acid**
CASRN	5419-55-6	67-63-0	10043-35-3
Molecular Weight	188.08	60.10	61.83
Physical State	Liquid	Liquid	Solid
Melting Point	-59°C (measured)[4] -70 to -72°C (measured, MSDS)	-89.5ºC (measured)[2]	170.9ºC (measured)[2]
Boiling Point	140°C (measured)	82.3ºC (measured)[2]	616.55ºC (estimated)[3]
Vapor Pressure	8.6 mm Hg at 25°C (measured)	45.4 mm Hg at 25ºC (measured)[2]	7.36×10^{-17} mm Hg (estimated)[3]
Water Solubility	unstable in water, hydrolyzes rapidly, <15 min. at 25–37°C to isopropanol and boric acid (measured from hydrolysis test) 3.35×10^{3} mg/L (estimate)[3]	Miscible at 25ºC (measured)[2]	5×10^{4} mg/L at 25°C (measured)[2]
Dissociation Constant (pK_a)	Not applicable	17.10 (measured)[2]	9.24 (measured)[2]
Henry's Law Constant	6.47×10^{-4} atm-m^3/mole (estimated)	8.10×10^{-6} atm-m^3/mole (measured)[2]	1.2×10^{-22} atm-m^3/mole (estimated)[3]
Log K_{ow}	0.83 (estimated)	0.05 (measured)[5]	-0.175 (measured)[6]

[1]E.I. du Pont de Nemours and Company, Inc. March 18, 2008. Revised Robust Summary for Triisopropylborate. http://www.epa.gov/hpv/pubs/summaries/triprobt/c14841tc.htm.
[2]SRC. 2008. The Physical Properties Database (PHYSPROP). Syracuse, NY: Syracuse Research Corporation. Available from http://www.syrres.com/esc/physprop.htm as of September 30, 2008.
[3]U.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.
[4]Lewis RJ Sr. 2000. Sax's Dangerous Properties of Industrial Materials. 10th ed. New York, NY: John Wiley & Sons, Inc., p. 2157.
[5]Hansch, C., Leo, A., D. Hoekman. Exploring QSAR - Hydrophobic, Electronic, and Steric Constants. Washington, DC: American Chemical Society., 1995., p. 7
[6]WHO; Environmental Health Criteria 204, Boron. World Health Org (1998). Available at http://www.inchem.org/documents/ehc/ehc/ehc204.htm as of Apr 18, 2005

2. General Information on Exposure

2.1 Production Volume and Use Pattern

This chemical had an aggregated production volume in the United States of 1 million to 10 million pounds during calendar year 2005. Information on uses reported in the IUR submissions was claimed confidential. The HPV submission states that the chemical is primarily used in pharmaceutical organic synthesis and as a lubricant additive.

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. Triisopropylborate is a liquid with high vapor pressure. It has high estimated water solubility and it undergoes rapid hydrolysis to form isopropanol and boric acid. It is expected to have moderate mobility in soil. The rate of volatilization of triisopropylborate from water and moist soil is considered moderate based on its estimated Henry's Law constant; however, the rapid rate of hydrolysis will make this environmental fate process irrelevant. The rate of atmospheric photooxidation is considered moderate. Triisopropylborate is expected to have low persistence (P1) and low bioaccumulation potential (B1).

Table 2. Environmental Fate Characteristics of Triisopropylborate[1]			
	Sponsored Chemical	**Supporting Chemicals**	
Property	**Triisopropylborate**	**Isopropanol**	**Boric acid**
Photodegradation Half-life	10.55 hours (estimated)	1.5 days (estimated) (not susceptible to direct photolysis)[2]	25.5 days (estimated) (not susceptible to direct photolysis)[2]
Hydrolysis Half-life	<15 minutes at pH 9, 7, and 4 (measured)	Stable in water	Unstable in water
Biodegradation	Hydrolyzes rapidly	86% after 14 days (measured) (readily biodegradable)	Not known to be subject to biodegradation
Bioconcentration	BCF = 3.162 (estimated)	BCF = 3.162 (estimated)	BCF = 3.162 (estimated)
Log K_{oc}	2.77 (estimated)	0.025 (estimated)[2]	1.55 (estimated)[2]
Fugacity (Level III Model)	Air = 7.93% Water = 61.5% Soil = 30.5% Sediment = 0.12%	Air = 4.67% Water = 46.4% Soil = 48.9% Sediment = 0.0587% (estimated)[2]	Air = 1.04×10^{-5}% Water = 38.2% Soil = 61.7% Sediment = 0.0709% (estimated)[2]
Persistence[3]	P1 (low)	P1 (low)	P3 (high)
Bioaccumulation[3]	B1 (low)	B1 (low)	B1 (low)

[1]E.I. du Pont de Nemours and Company, Inc. March 18, 2008. Revised Robust Summary for Triisopropylborate. http://www.epa.gov/hpv/pubs/summaries/triprobt/c14841tc.htm.
[2]U.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.
[3]Federal Register. 1999. Category for Persistent, Bioaccumulative, and Toxic New Chemical Substances. *Federal Register* 64, Number 213 (November 4, 1999) pp. 60194–60204.

3. Human Health Hazard

Triisopropylborate (CASRN 5419-55-6)

Acute Oral Toxicity

ChR-CD rats (10 males/dose) were administered triisopropylborate via gavage at 0, 7000, 7500, 8000 or 9000 mg/kg-bw and observed for 14 days. Mortality was reported at 7500, 8000 and 9000 mg/kg-bw. All mortality occurred 1 – 3 days after dosing. Clinical signs of toxicity observed at doses of ≥ 7000 mg/kg-bw included chromodacryorrhea, diarrhea, piloerection and unkempt fur.
LD_{50} = 8126 mg/kg-bw

Genetic Toxicity – Gene Mutation

In vitro
Salmonella typhimurium strains TA98, TA100, TA1535, TA1537 and TA1538 were exposed to triisopropylborate at 0, 1000, 3000, 5000, 7000, and 10,000 mg/plate in the presence and absence of metabolic activation. Cytotoxicity was not seen at the highest tested concentration. Triisopropylborate did not induce mutagenic response either in the presence or absence of metabolic activation. Positive and negative controls were included in the assay responded appropriately.
Triisopropylborate was not mutagenic in this assay.

Skin Irritation

Albino guinea pigs (10 males/dose) were administered approximately 0.05 mL of triisopropylborate (purity not provided) dermally on shaved, intact skin at 25 or 100%. The test substance did not produce primary irritation in any guinea pig tested.
Triisopropylborate was not irritating to guinea pig skin in this study.

Eye Irritation

Rabbits (2, strain and sex not stated) were administered 0.1 mL of undiluted triisopropylborate (purity not provided) into the right conjunctival sac of the eye. After 20 seconds, treated eye of one rabbit was washed with water for 1 minute and the treated eye of the other rabbit was not washed. Observations were made at 1 and 4 hours, and on days 1, 2 and 3 following instillation. The test substance produced no corneal, iritic or conjunctival effects in the rabbit eye. Both treated eyes were normal after 1 hour.
Triisopropylborate was not irritating to rabbit eyes in this study.

Skin Sensitization

Guinea pigs (10 males/dose) were administered triisopropylborate (purity not provided) as a series of four sacral intradermal injections, one each week over a 3-week period, which consisted of 0.1 mL of a 1% solution in saline. After a 2-week rest period, the animals were challenged by applying 0.05 mL of triisopropylborate as originally received and as a 25% solution (v/v) in water on the shoulder.
Triisopropylborate was not a skin sensitizer in this study.

Boric Acid (CASRN 10043-35-3, supporting chemical)

The U.S. EPA has evaluated boric acid for the IRIS program and the assessment is available at: www.epa.gov/ncea/iris/toxreviews/0410-tr.pdf.

Isopropanol (CASRN 67-63-0, supporting chemical)

OECD SIDS Initial Assessment Profiles (SIAP) and SIDS Initial Assessment Reports (SIAR) are available at:
http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html. These documents are presented in an international forum that involves review and endorsement by governmental authorities around the world. The U.S. EPA is an active participant in these meetings and accepts these documents as reliable screening-level hazard assessments for the purpose of the U.S. HPV Challenge qualitative risk characterization process.

Conclusion: Acute oral toxicity of CASRN 5419-55-6 to rats is low. CASRN 5419-55-6 is not irritating to Guinea pig skin and rabbit eyes. It is not a dermal sensitizer in Guinea pigs.

Several repeated-dose, reproductive, and developmental toxicity studies in multiple species have been conducted with supporting chemicals CASRN 10043-35-3 (boric acid) and CASRN 67-63-0 (isopropanol).

In repeated oral-exposure, sub-chronic (13 weeks) and chronic (104 weeks) studies of rats, mice and dogs with CASRN 10043-35-3, the most sensitive and primary target organ was testes. Decreased absolute and relative testes weight, testicular atrophy, decreased spermatogenesis, and effects on thyroid, spleen and liver were seen at a lowest LOAEL of 21.8 mg/kg-bw/day (calculated as mg of Boron) among these studies. In reproductive toxicity studies, the reported testicular effects include decreased absolute and relative (to body weight) testes weight, testicular atrophy, degeneration of the spermatogenic epithelium, impaired spermatogenesis, reduced fertility and sterility. The lowest LOAEL among these studies was 26.6 mg/kg-bw/day (calculated as Boron). In several developmental toxicity studies, the reported developmental effects include high prenatal mortality; decreased fetal body weight, malformations and variations of the eyes, CNS, cardiovascular system, and axial skeleton. Increased incidences of short rib XIII and wavy rib, and a decreased incidence of rudimentary extra rib on lumbar I were the most common anomalies in both rats and mice with LOAEL values of 13.3 mg/kg-bw/day and 79 mg/kg-bw/day, respectively. Cardiovascular malformations, especially inter-ventricular septal defect, and variations were the frequent anomalies in rabbits with a LOAEL of 47.7 mg/kg-bw/day. CASRN 10043-35-3 did not induce gene mutation or chromosomal aberrations.

CASRN 67-63-0 showed low acute oral and inhalation toxicity in rats and low acute dermal toxicity in rabbits. It is not irritating to rabbit skin; however, it is irritating to rabbit eyes. CASRN 67-63-0 is not a skin sensitizer in Guinea pigs. The target organ following repeated inhalation exposure to CASRN 67-63-0 in rats (13 weeks) and mice (18 months) was the kidney. Rats exhibited male specific chronic progressive nephropathy with a LOAEC of approximately12.3 mg/L/day (5000 ppm). Mice showed renal tubular proteinosis and tubular dilation with a LOAEC of approximately 6.1 mg/L/day (2500 ppm). In a two-generation reproductive study via gavage, the only reproductive parameter apparently affected by CASRN 67-63-0 exposure was a statistically significant decrease in male mating index of the F_1 males. The NOAEL was 100 mg/kg/day. The developmental toxicity studies showed a NOAEL of 400 mg/kg/day for rats and 480 mg/kg/day for rabbits. The developmental neurotoxicity

study did not show any neurotoxicity with a NOAEL of 1200 mg/kg-bw/day. CASRN 67-63-0 did not induce gene mutation in *in vitro* tests and did not induce chromosomal aberrations in *in vivo* test. CASRN 67-63-0 did not show an increase in the tumor incidence in rats or mice.

4. Hazard to the Environment

The environmental hazard data are summarized in Table 3.

Triisopropylborate is expected to hydrolyze rapidly; therefore, data for hydrolysis products are used to assess aquatic toxicity.

Acute Toxicity to Fish

Isopropanol (CASRN 67-63-0, supporting chemical)
Fathead minnows (*Pimephales promelas*) were exposed to isopropanol at five unspecified nominal concentrations under flow-through conditions for 96 hours. No other details were provided.
96-h LC_{50} = 9640 – 10,400 mg/L

Boric acid (CASRN 10043-35-3, supporting chemical)
Coho salmon (*Oncorhynchus kisutch*) were exposed to boric acid at five unspecified nominal concentrations under static conditions for 96 hours. Two life stages were compared in one test; swim-up fry (8 – 12 weeks post-hatch) were tested in freshwater and advanced fry (8 – 12 weeks post-hatch) were tested in brackish water. Young Coho salmon tested in freshwater were less tolerant than older fish tested in brackish water.
96-h LC_{50} (freshwater) = 447 mg/L
96-h LC_{50} (brackish water) = 600 mg/L

Acute Toxicity to Aquatic Invertebrates

Isopropanol (CASRN 67-63-0, supporting chemical)
(1) Mysid shrimp (*Mysidopsis bahia*) were exposed to isopropanol at nominal concentrations of 0, 625, 1250, 2500, 5000, 10,000 or 20,000 mg/L under static conditions for 96 hours. Mortality was 100% at 10,000 and 20,000 mg/L after 96 hours.
96-h LC_{50} = 4050 mg/L

(2) Water fleas (*Daphnia magna*) were exposed to isopropanol at unspecified nominal concentrations under unspecified conditions for 24 hours. No other details were provided.
24-h EC_{50} = 29,906 mg/L

Boric acid (CASRN 10043-35-3, supporting chemical)
Water fleas (*Daphnia magna*) were exposed to boric acid at nominal concentrations of 0, 54, 91, 151, 252, 420 or 700 mg/L (as boron) under static conditions for 48 hours. At 420 mg/L after 48 hours, 100% mortality was observed.
48-h LC_{50} = 133 mg/L

Toxicity to Aquatic Plants

Isopropanol (CASRN 67-63-0, supporting chemical)
Green algae (*Pseudokirchneriella subcapitata*) were exposed to isopropanol at nominal concentrations of 0, 3125, 6250, 12,500, 25,000 or 50,000 mg/L under static conditions for 5 days followed by a 9-day recovery period. The 5-day algistatic concentration was 54,294 mg/L. This study was conducted to determine algistatic concentration of isopropanol and is not a standard protocol considered for the purposes of the HPV Challenge Program. However, EPA corroborated the low toxicity of isopropanol to algae with a 96-hour EC50 for algae estimated by ECOSAR (v1.00) (149 mg/L).
96-h EC_{50} = 149 mg/L (estimated)

Chronic Toxicity to Fish

Boric acid (CASRN 10043-35-3, supporting chemical)
(1) Fertilized eggs from rainbow trout (*Salmo gairdneri*) were exposed to boric acid at nominal concentrations of 0.001, 0.01, 0.1, 0.5, 1, 5, 10, 25, 50, 100 or 200 mg/L under flow-through conditions through 4 days post-hatching (total exposure time of 28 days). Measured concentrations reported for nominal concentrations ≥ 0.1 mg/L were 0.11, not tested, 1.0, 4.74, 9.26, 23.5, 45.5, 94.0 or 190.0 mg/L in soft water and 0.1, 0.47, 0.98, 4.85, 9.40, 23.8, 48.3, 100.2 or 186.0 mg/L in hard water, respectively. A high incidence of teratogenesis was observed at boric acid concentrations between 1 and 200 mg/L.
LC_{50} (soft water, hatching) = 150 mg/L
LC_{50} (soft water, 4-d post hatching) = 100 mg/L
LC_{50} (hard water, hatching) = 100 mg/L
LC_{50} (hard water, 4-d post hatching) = 79 mg/L

(2) Fertilized eggs from channel catfish (*Ictalurus punctatus*) were exposed to boric acid at nominal concentrations of 0.01, 0.05, 0.1, 0.5, 0.75, 1, 2.5, 5, 7.5, 10, 25, 50, 75, 100, 150, 200 or 300 mg/L under flow-through conditions through 4 days post-hatching (total exposure time of 9 days). Measured concentrations reported for nominal concentrations ≥ 0.1 mg/L were 0.11, 0.49, not tested, 1.01, not tested, 5.42, 7.43, 10.0, 24.9, 51.4, not tested, 98.3, 151.0, 177.0 or 306.41 mg/L in soft water and not tested, 0.53, 0.77, 0.96, 2.33, 4.9, 7.4, 9.43, 25.1, 48.3, 77.7, not tested, 140, not tested or 302.0 mg/L in hard water.
LC_{50} (soft water, hatching) = 220 mg/L
LC_{50} (soft water, 4-d post hatching) = 155 mg/L
LC_{50} (hard water, hatching) = 102 mg/L
LC_{50} (hard water, 4-d post hatching) = 22 mg/L

(3) Fertilized eggs from goldfish (*Casrassius auratus*) were exposed to boric acid at nominal concentrations of 0.05, 0.1, 0.5, 1, 5, 7.5, 10, 25, 50, 100, 200 or 300 mg/L under flow-through conditions through 4 days post-hatching (total exposure time of 7 days). Measured concentrations reported for nominal concentrations ≥ 0.1 mg/L were 0.1, 0.49, 0.9, 5.2, 7.0, 9.2, 22.5, 48.7, 108, 188.7 or 288 mg/L for soft water and 0.12, 0.47, 0.9, 4.5, 6.8, 8.33, 32.0, 51.30, 96.7, 191 or 290 mg/L for hard water. Teratogenesis occurred only at concentrations ≥ 100 mg/L.

LC_{50} (soft water, hatching) = 178 mg/L
LC_{50} (soft water, 4-d post hatching) = 46 mg/L
LC_{50} (hard water, hatching) = 170 mg/L
LC_{50} (hard water, 4-d post hatching) = 75 mg/L

Chronic Toxicity to Aquatic Invertebrates

Isopropanol (CASRN 67-63-0, supporting chemical)

Water fleas (*Daphnia magna*) (15/concentration) were exposed to isopropanol at unspecified nominal concentrations under static renewal conditions for 16 days. Measured concentrations from samples taken before and after renewal of the test solutions were 80 – 110% of the nominal concentrations (specific values not reported). Growth was measured as the difference in daphnid length from the beginning to the end of the experiment 16 days later.

16-day NOEC (growth) = 0.63 mg/L
16-day EC_{50} (reproduction) = 0.89 mg/L

Boric acid (CASRN 10043-35-3, supporting chemical)

(1) Water fleas (*Daphnia magna*) were exposed to boric acid at nominal concentrations 0, 7, 14, 28, 56 or 105 mg/L (as boron) under static renewal conditions for 21 days. Measured concentrations were 0, 6.4, 13.6, 29.4 or 59.3 mg/L, respectively. Mortality during the 21-day test was 0, 0, 10, 5, 40 and 100% at 0, 7, 14, 28, 56 and 105 mg/L concentration levels, respectively. The 21-day MATC, based on total young/replicate, mean brood size, and mean size, was estimated to be between 6.4 and 13.6 mg/L as boron.

21-d EC_{50} = 52.2 mg/L

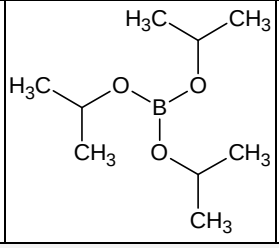
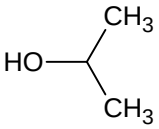
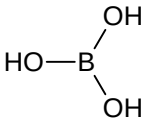
(2) Water fleas (*Ceriodaphnia dubia*) were exposed to boric acid at nominal concentrations of 0, 6.25, 12.5, 25, 50 or 100 mg/L under static renewal conditions for 8 days. Measured concentrations were not reported. The number of surviving adults and offspring were counted and signs of toxicity were recorded (immobilization, loss of equilibrium, erratic swimming, loss of reflex, excitability, discoloration or changes in behavior). The percentage of surviving adults was not affected by treatment and signs of toxicity were not observed. The mean number of young per surviving adult was lower at concentrations ≥ 25 mg/L.

8-d LOEC = 25 mg/L
8-d NOEC = 12.5 mg/L
MATC = 17.7 mg/L
8-d EC_{50} > 100 mg/L

(3) Water fleas (*Daphnia magna*) were exposed to boric acid at unspecified nominal concentrations under static renewal conditions for 14 days. Measured concentrations were not reported. Survival, reproduction and growth were reduced at 28 mg/L. No other toxic effects were observed. The reported MATC was between 13.8 and 28.1 mg/L and between 14.3 and 28.9 mg/L for two separate tests (geometric mean values of 19.7 and 20.3 mg/L, respectively). **14-d NOEL ~ 14 mg/L**

Conclusion: The acute aquatic toxicity values of CASRN 5419-55-6, based on its hydrolysis products (CASRNs 10043-35-3 and 67-63-0), for fish, aquatic invertebrates, and aquatic plants are >100 mg/L. The 21-day EC_{50} for aquatic invertebrates for CASRN 10043-35-3 is 52.2 mg/L.

Table 3. Summary Table of the Screening Information Data Set as Submitted under the U.S. HPV Challenge Program

Endpoints	**SPONSORED CHEMICAL Triisopropylborate (5419-55-6)**	**SUPPORTING CHEMICAL Isopropanol (67-63-0, supporting chemical)**	**SUPPORTING CHEMICAL Boric acid (10043-35-3, supporting chemical)**
Structure			
Summary of Environmental Effects – Aquatic Toxicity Data			
Fish 96-h LC_{50} (mg/L)	**–**	**9640 – 10,400**	**447**
Aquatic Invertebrates 48-h EC_{50} (mg/L)	**–**	**4050 (96-h)**	**133**
Aquatic Plants 72-h EC_{50} (mg/L) (growth) (biomass)	**–**	**54,294 (5-d algistatic)** 149 (96-h EC_{50} estimate)	**–**
Chronic Toxicity to Aquatic Invertebrates 21-day EC_{50} (mg/L)	**–**		**52.2**

– indicates endpoint was not addressed for this chemical; * indicates endpoint is not included in the base data set under the HPV Challenge Program