Supporting Documents for Initial Risk-Based Prioritization of High Production Volume Chemicals

Methane Sulfonic Acid (CAS No. 75-75-2)
[9th CI Name: Methane Sulfonic Acid]

Contents:

- **Page 2: Background**
- **Page 4: Screening-Level Risk Characterization: July 2008**
- **Page 8: Screening-Level Hazard Characterization: July 2008**
- **Page 17: Screening-Level Exposure Characterizations: July 2008**

BACKGROUND

Screening-level hazard, exposure and risk characterizations for high production volume chemicals (HPV) are important contributions to the chemicals cooperation work being done in North America[1] through the EPA Chemical Assessment and Management Program (ChAMP)[2]. These screening-level characterizations are developed by EPA for individual chemicals or chemical categories to support initial Risk-Based Prioritizations (RBPs) for HPV chemicals. These screening-level characterizations are technical documents intended primarily to inform the Agency's internal decision-making process. Accordingly, they are written for assessment professionals and assume a degree of technical understanding. Each of the support documents is described below.

The Risk-Based Prioritizations are found in an accompanying document and are written for a general audience. They present EPA's initial thinking regarding the potential risks presented by these chemicals and future possible actions that may be needed.

Hazard Characterizations for HPV Chemicals

EPA's screening-level hazard characterizations are based primarily on the review of the summaries of studies and other information submitted by the chemical sponsor(s) under the HPV Challenge Program[3]. These studies included in the scope of the HPV Challenge comprise the Screening Information Data Set (SIDS) of the Organization for Economic Cooperation and Development (OECD)[4], an internationally recognized battery of tests that provides the basic data necessary to make an initial evaluation of a chemical's hazards and fate. In preparing the initial hazard characterizations, EPA also consulted a variety of reliable sources[5] for additional relevant information and 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 an HPV submission, EPA also searched publicly available databases[6] for information entered from one year prior to the HPV submission through May 2008. The screening-level hazard characterization is performed according to established EPA guidance[7]. A more detailed description of the hazard characterization process is available on the EPA website[8].

With respect to chemicals for which internationally-accepted OECD SIDS Initial Assessment Profiles (SIAP) and Initial Assessment Reports (SIAR) were available, EPA did not generate its own screening-level hazard characterization, but did check for and incorporate updated information in the risk characterization.

Exposure Characterizations for HPV Chemicals

EPA recently received exposure-related data on chemicals submitted in accordance with the requirements of Inventory Update Reporting (IUR)[9]. The 2006 IUR submissions pertain to chemicals manufactured in

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[1] U.S. EPA – U.S. Commitments to North American Chemicals Cooperation: http://www.epa.gov/hpv/pubs/general/sppframework.htm.
[2] U.S. EPA – ChAMP information: http://www.epa.gov/champ/.
[3] U.S. EPA – HPV Challenge Program information: http://www.epa.gov/hpv.
[4] U.S. EPA – Technical Guidance Document, OECD SIDS Manual Sections 3.4 and 3.5: http://www.epa.gov/chemrtk/pubs/general/sidsappb.htm.
[5] U.S. EPA – Public Database Hazard Information: http://www.epa.gov/hpvis/hazardinfo.htm.
[6] U.S. EPA – Public Database Update Information: http://www.epa.gov/chemrtk/hpvis/updateinfo.htm.
[7] U.S. EPA – Risk Assessment Guidelines: http://cfpub.epa.gov/ncea/raf/rafguid.cfm.
[8] U.S. EPA – About HPV Chemical Hazard Characterizations: http://www.epa.gov/hpvis/abouthc.htm.
[9] U.S. EPA – Basic IUR Information: http://www.epa.gov/opptintr/iur/pubs/guidance/basic-information.htm.

(including imported into) the U.S. during calendar year 2005 in quantities of 25,000 pounds or more at a single site. The reports include the identity, the quantity, and the physical form of the chemical manufactured or imported, and the number of workers reasonably likely to be exposed during manufacture of the chemical. For chemicals manufactured or imported in quantities of 300,000 pounds or more at a single site, additional reported information includes: the industrial processing and uses of the chemical; the number of industrial processing sites and workers reasonably likely to be exposed to the chemical at those sites; the consumer and commercial uses of the chemical; and an indication whether the chemical was used in products intended for use by children under 14 years of age.

EPA's screening-level exposure characterizations are based largely on the information submitted under the IUR reporting, although other exposure information submitted to the Agency (for example, in HPV submissions) or readily available through a limited set of publicly accessible databases[10] was also considered. The screening-level Exposure Characterizations identify a potential (high, medium, or low) that each of five populations – the environment, the general population, workers, consumers, and children – might be exposed to the chemical. In most cases, this potential doesn't address the quantity, frequency, or duration of exposure, but refers only to the likelihood that an exposure could occur.

In many instances EPA is not able to fully disclose to the public all the IUR exposure-related data reviewed or relied upon in the development of the screening-level documents because some of the material was claimed as confidential business information (CBI) when it was submitted to the Agency. These CBI claims do limit the Agency's ability to be completely transparent in presenting some underlying exposure and use data for chemicals in public documents. EPA does consider all data, including data considered to be CBI, in the screening-level exposure and risk characterization process, and endeavors whenever possible to broadly characterize supporting materials claimed as confidential in ways that do not disclose actual CBI.

Risk Characterizations for HPV Chemicals

EPA combines the information from the screening-level exposure characterization with the screening-level hazard characterization to develop a qualitative screening-level risk characterization, as described in the Agency's guidance on drafting risk characterizations[11]. These screening-level risk characterizations are technical documents intended to support subsequent priority-setting decisions and actions by OPPT. The purpose of the qualitative screening-level risk characterization is two-fold: to support initial risk-based decisions to prioritize chemicals, identify potential concerns, and inform risk management options; and to identify data needs for individual chemicals or chemical categories.

These initial characterization and prioritization documents do not constitute a final Agency determination as to risk, nor do they determine whether sufficient data are available to characterize risk. Recommended actions reflect EPA's relative judgment regarding this chemical or chemical category in comparison with others evaluated under this program, as well as the uncertainties presented by gaps that may exist in the available data.

[10] U.S. EPA – Summary of Public Databases Routinely Searched: http://www.epa.gov/chemrtk/hpvis/pubdtsum.htm.
[11] U.S. EPA – Risk Characterization Program: http://www.epa.gov/osa/spc/2riskchr.htm.

QUALITATIVE SCREENING-LEVEL RISK CHARACTERIZATION OF HIGH PRODUCTION VOLUME CHEMICALS

SPONSORED CHEMICAL

Methane Sulfonic Acid (CAS No. 75-75-2)
[9th CI Name: Methane Sulfonic Acid]

July 2008

Prepared by

Risk Assessment Division
Economics, Exposure and Technology Division
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QUALITATIVE SCREENING-LEVEL RISK CHARACTERIZATION FOR Methane Sulfonic Acid (CAS No. 75-75-2)

1. Physical-Chemical Properties and Environmental Fate

Methane sulfonic acid is a liquid at room temperature. It has low volatility and high mobility in soil. Methane sulfonic acid is expected to undergo atmospheric photooxidation slowly and biodegrade rapidly. The persistence and bioaccumulation ranking for methane sulfonic acid are low (P1 and B1).

2. Hazard Characterization

The evaluation of available aquatic toxicity data for fish, aquatic invertebrates and aquatic plants indicates that the potential acute hazard of methane sulfonic acid to fish and aquatic plants is low and to aquatic invertebrates is moderate.

Methane sulfonic acid showed moderate acute oral toxicity to rats and moderate acute dermal toxicity to rabbits. Methane sulfonic acid is corrosive to mouse skin, extremely corrosive to the eye, but showed no evidence of dermal sensitization. Following repeated nose-only inhalation exposures in rats to low concentrations, clear evidence of portal-of-entry effects, such as histopathological lesions in the nasal turbinates were observed. No effects were seen for parental toxicity or reproductive performance in a combined reproductive/developmental toxicity screening test. Available prenatal developmental toxicity data showed some evidence of slight maternal toxicity but no developmental effects. Methane sulfonic acid was not mutagenic and did not induce chromosomal aberrations.

The potential health hazard of methane sulfonic acid is moderate based on portal-of-entry effects following repeated inhalation exposures.

3. Exposure Characterization

Methane sulfonic acid has an aggregated production and/or import volume in the United States of 1 to 10 million pounds. Industrially, the chemical is processed as a reactant, incorporated into formulations, and used for a variety of functions, including in plating agents and metal surface treating agents, for electronic components manufacturing, in photosensitive chemicals, in soap and cleaning compound manufacturing, with solvents for cleaning or degreasing, among others. For commercial and consumer uses, the chemical is in electrical and electronic products, metal products, rubber and plastic products, and soaps and detergents.

Potential Exposures to the General Population and the Environment. Based on the reported use information, it is likely that there would be some releases to water or air during manufacturing, processing, and use. A search of additional relevant databases provided further information on releases of this chemical. This chemical was found in measurable amounts in air, Antarctic ice, marine algae and salt marsh plants; the latter two are natural sources of dimethyl sulfide, which is photochemically oxidized to methane sulfonic acid. Based on the totality of the information considered—known uses, chemical presence in monitoring data, and the Agency's expert

judgment—EPA identifies, for purposes of risk-based prioritization, a high potential for exposure to the general population and the environment, although the degree of exposure that can be attributed to TSCA uses cannot be determined from the references examined.

Potential Exposures to Workers. Based on the totality of the information considered (primarily IUR data) in combination with Agency's professional judgment, EPA identifies, for the purposes of risk-based prioritization, a medium relative ranking for potential worker exposure. This relative ranking is based mainly on the corrosive and moisture sensitive nature of the chemical, which would likely require workers to wear adequate personal protective equipment (PPE) during exposures to the chemical in concentrated forms. The ranking is also based on uncertainty regarding the extent of PPE used by workers who may be exposed at lower concentrations. This chemical does not have OSHA Permissible Exposure Limits (PELs).

Potential Exposures to Consumers. Depending on the consumer product, there may be dermal and/or inhalation exposures to consumers from vapors, mists, or particulates. EPA identifies, for the purposes of risk-based prioritization, a high potential that consumers may be exposed to this chemical based on IUR data and information from public data sources that indicate this chemical is found in household products.

Potential Exposures to Children. No uses in products specifically intended to be used by children were reported in the IUR, nor were any found in other data sources. Exposures to children, however, may be expected to occur through the household use of some consumer products. Therefore, EPA identifies a medium potential that children may be exposed.

4. Risk Characterization

The statements and rationale provided below are intended solely for the purpose of this qualitative screening-level risk characterization and will be used for prioritizing substances for future work in the Chemical Assessment and Management Program (ChAMP).

Risk Statement and Rationale

Potential Risk to Aquatic Organisms from Environmental Releases (LOW/MEDIUM CONCERN). EPA identifies a high potential for exposure to aquatic organisms from environmental releases. Methane sulfonic acid has low persistence and low bioaccumulation. These characteristics in combination with the low acute toxicity for fish and low acute aquatic hazard for plants indicate a low concern for potential risk for fish and a low concern for potential risk to aquatic plants. These characteristics in combination with a moderate acute aquatic hazard for invertebrates suggests a moderate concern for potential risk to aquatic invertebrates.

Potential Risk to the General Population from Environmental Releases (LOW CONCERN). EPA identifies a high potential for exposure to the general population from environmental releases. The potential human health hazard is expected to be moderate due to toxicity in animals following repeated exposures. However, methane sulfonic acid is highly corrosive and therefore potential exposures will be self-limiting. Given the moderate hazard, the environmental fate characteristics of low persistence and low bioaccumulation, together with low self-limiting exposure suggest a low concern for potential risk to the general population from environmental releases.

Potential Risk to Workers (LOW CONCERN). EPA identifies a medium potential for worker exposure. The potential human health hazard is expected to be moderate due to toxicity in animals following repeated exposures. There is potential for mild skin and eye irritation; however, adherence to standard good industrial hygiene practices (gloves, respirators, goggles, and other protective clothing) to prevent irritation will limit the exposure of workers. Therefore, taken together, the available information suggests a low concern for potential risks to workers.

Potential Risk to Consumers from Known Uses (LOW CONCERN). EPA identifies a high potential that consumers may be exposed. The potential human health hazard is expected to be moderate due to toxicity in animals following repeated exposures. However, methane sulfonic acid is highly corrosive and therefore potential exposures will be self-limiting. Taken together, the available information suggests a low concern for potential risks to consumers.

Potential Risk to Children (LOW CONCERN). EPA identifies a medium potential that children may be exposed. No uses in products specifically intended to be used by children were reported in the IUR, nor were any found in other data sources. Exposures to children, however, may be expected to occur through the household use of some consumer products. However, the hazard concern is for the corrosive nature of methane sulfonic acid, and consumer products that children may come into contact with would likely not contain methane sulfonic acid at corrosive levels.

SCREENING-LEVEL HAZARD CHARACTERIZATION OF HIGH PRODUCTION VOLUME CHEMICALS

SPONSORED CHEMICAL

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SCREENING-LEVEL HAZARD CHARACTERIZATION OF HIGH PRODUCTION VOLUME CHEMICALS

SCREENING-LEVEL HAZARD CHARACTERIZATION
Methane Sulfonic Acid (CAS No. 75-75-2)

Introduction

The sponsor, Atofina Chemicals, Inc and Chevron Phillips Chemical Company LP, submitted a Test Plan and Robust Summaries to EPA for methane sulfonic acid (CAS No. 75-75-2; 9th CI name: methane sulfonic acid) dated January 10, 2003. EPA posted the submission on the ChemRTK HPV Challenge Web site on January 17, 2003 (http://www.epa.gov/chemrtk/pubs/summaries/methanes/c14249tc.htm). EPA comments were submitted on June 17, 2003. Public comments were also received and posted to the website. The sponsor responded on August 25, 2003.

This screening-level hazard characterization is based primarily on the review of the test plan and robust summaries of studies submitted by the sponsor(s) under the HPV Challenge Program. 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 2002 to May 2008: the NLM databases (ChemID to locate available data sources including Medline/PubMed, Toxline, HSDB, ATSDR, EPA SRS, etc.), STN/CAS online databases (Registry file for locators, ChemAbs for toxicology data, RTECS, Merck, etc.) and Science Direct. A summary table of SIDS endpoint data with the structure(s) of the sponsored chemical(s) is included in the appendix. The screening-level hazard characterization for environmental and human health toxicity is based largely on SIDS endpoints and is described according to established EPA or OECD effect level definitions and hazard assessment practices.

Hazard Characterization

Methane sulfonic acid is a liquid at room temperature. It has low volatility and high mobility in soil. Methane sulfonic acid is expected to undergo atmospheric photooxidation slowly and biodegrade rapidly. Methane sulfonic acid is expected to have low persistence (P1) and low bioaccumulation potential (B1).

The evaluation of available aquatic toxicity data for fish, aquatic invertebrates and aquatic plants indicates that the potential acute hazard of methane sulfonic acid to fish and aquatic plants is low and to aquatic invertebrates is moderate.

Methane sulfonic acid showed moderate acute oral toxicity to rats and moderate acute dermal toxicity to rabbits. Methane sulfonic acid is corrosive to mouse skin, extremely corrosive to the eye, but showed no evidence of dermal sensitization. Following repeated nose-only inhalation exposures in rats to low concentrations, clear evidence of portal-of-entry effects, such as histopathological lesions in the nasal turbinates were observed. No effects were seen for parental toxicity or reproductive performance in a combined reproductive/developmental toxicity screening test. Available prenatal developmental toxicity data showed some evidence of slight maternal toxicity but no developmental effects. Methane sulfonic acid was not mutagenic and did not induce chromosomal aberrations.

The potential health hazard of methane sulfonic acid is moderate based on portal-of-entry effects following repeated inhalation exposures.

No data gaps were identified under the HPV Challenge Program.

1. Physical-Chemical Properties and Environmental Fate

The physical-chemical properties of methane sulfonic acid are summarized in Table 1a, while its environmental fate properties are provided in Table 1b. The structure of the compound is provided in the Appendix.

Physical-Chemical Properties Characterization

Methane sulfonic acid is a liquid at room temperature. Methane sulfonic acid is a strong acid with pK_a of -1.92. Methane sulfonic acid has a moderate vapor pressure of 4.28×10^{-4} mm Hg at 25 °C and is miscible in water.

Table 1a. Physical-Chemical Properties of Methane Sulfonic Acid[1]

Property	Value
CAS No.	75-75-2
Molecular Weight	96.10
Physical State	Liquid at room temperature[2]
Melting Point	19°C (measured)
Boiling Point	167°C at 10 mm Hg; Decomposition at 225°C (measured)
Vapor Pressure	9.75×10^{-3} mm Hg at 20°C (measured) 4.28×10^{-4} mm Hg at 25°C[2]
Water Solubility	1000 g/L at 20°C 1×10^{6} mg/L; miscible[2] (measured)
Dissociation Constant (pK_a)	-1.92 (measured)
Henry's Law Constant	1.26×10^{-8} atm-m^3/mole[3]
Log K_{ow}	-4.98 (estimated) -2.38 (estimated)[3]

[1]Arkema Inc. 2004. HPV Robust Summaries for Methane Sulfonic Acid. http://www.epa.gov/chemrtk/pubs/summaries/methanes/c14249tc.htm; Daubert, T.E., Danner, R.P.; Physical and Thermodynamic Properties of Pure Chemicals Data Compilation. Washington, D.C.: Taylor and Francis, 1989.
[2] HSDB. 2008. Hazard Substances Data Base. Accessed March 10, 2008. http://toxnet.nlm.nih.gov/.
[3] US 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.

Environmental Fate Characterization

Methane sulfonic acid is a strong acid with pK_a of -1.92. This value indicates that methane sulfonic acid will exist as an anion in moist soils and water. Methane sulfonic acid is minimally volatile from water since anions do not volatilize. Methane sulfonic acid is highly mobile in soil with a Log Koc of 0.0 and biodegradation occurs rapidly, 100% of theoretical biochemical oxygen demand in 28 days using an activated sludge inoculum. If released to the atmosphere, methane sulfonic acid will degrade by reaction with photochemically produced hydroxyl radicals with an estimated half-life of approximately 58 days. Methane sulfonic acid is expected to have low persistence (P1) and low bioaccumulation potential (B1).

Table 1b. Physical-Chemical Properties of Methane Sulfonic Acid[1]	
Property	**Value**
Photodegradation Half-life	Half-life = 39 days Half-life = 58 days[2]
Hydrolysis Half-life	Not expected to undergo hydrolysis in the environment
Biodegradation	100% at 28 days (readily biodegradable) 86% after 55 days
Bioconcentration	BCF = 3[3]
Log K_{oc}	0.0 [3]
Fugacity (Level III Model)	Air: <1% Water: 40.7% Soil: 59.2% Sediment: <1%
Persistence	P1 (low)[4]
Bioaccumulation	B1 (low)[4]

[1]Arkema Inc. 2004. HPV Robust Summaries for Methane Sulfonic Acid. http://www.epa.gov/chemrtk/pubs/summaries/methanes/c14249tc.htm; Daubert, T.E., Danner, R.P.; Physical and Thermodynamic Properties of Pure Chemicals Data Compilation. Washington, D.C.: Taylor and Francis, 1989.
[2] HSDB. 2008. Hazard Substances Data Base. Accessed March 10, 2008. http://toxnet.nlm.nih.gov/.
[3] US 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]FR. 1999. Category for Persistent, Bioaccumulative, and Toxic New Chemical Substances. *Federal Register* 64, Number 213 (November 4, 1999) Page 60194-60204.

Conclusion: Methane sulfonic acid is a liquid at room temperature. It has low volatility and high mobility in soil. Methane sulfonic acid is expected to undergo atmospheric photooxidation slowly and biodegrade rapidly. Methane sulfonic acid is expected to have low persistence (P1) and low bioaccumulation potential (B1).

2. Environmental Effects – Aquatic Toxicity

Acute Toxicity to Fish

Rainbow trout (*Oncorhynchus mykiss*; 20/concentration) were exposed to methane sulfonic acid at nominal concentrations of 0, 13, 22, 37, 60 and 100 mg active ingredient (A.I)/L for 96 hours under static conditions. Mortality (100%) was seen only at 100 mg A.I./L. To evaluate the effect of pH on the toxicity of the test substance to the exposed organisms, a duplicate set of exposure solutions at the 60 and 100 mg/L concentrations were prepared and the pH of these solutions was adjusted to 7.1-7.3 with sodium hydroxide. No mortality occurred with the pH-adjusted solutions.
96-h LC_{50} = 73 mg A.I./L

Acute Toxicity to Aquatic Invertebrates

(1) *Daphnia magna* (10/concentration) were exposed to methane sulfonic acid at nominal concentrations of 0, 120, 210, 330, 570 or 890 mg A.I./L for 48 hours under static conditions. To evaluate the effect of pH on the toxicity of the test substance to the exposed organisms, a duplicate set of exposure solutions at the 60 and 100 mg/L concentrations were prepared and the pH of these solutions was adjusted to 7.9 - 8.3 with sodium hydroxide. Immobilization of organisms in the pH-adjusted solutions was similar to that of the control, suggesting that the acidic pH contributed to immobilization in the main test.
48-h EC_{50} = 260 mg A.I./L

(2) *Daphnia magna* (group size not indicated) were exposed to methane sulfonic acid for 24 hours. Test concentrations, group size and information on adjustment of pH were not provided, but the pH was 3.51. Neither nominal nor measured concentrations were provided in the robust summary.
24-h EC_{50} = 1.7 mg/L

Toxicity to Aquatic Plants

Green algae (*Pseudokirchneriella subcapitata*) were exposed to methane sulfonic acid at nominal concentrations of 0, 3.1, 6.3, 13, 25, 50 or 100 mg A.I./L with 50 and 100 mg A.I./L adjusted to pH 7.5. Measured concentrations were 0, 2.7, 5.8, 12, 24, 47 or 96 mg A.I./L with 49 and 95 mg A.I./L adjusted to pH 7.5. In the main test, inhibition of cell density, biomass and growth rate was 100% at >= 24 mg A.I./L. With adjustment to pH 7.5 cell densities at 49 and 95 mg A.I./L were similar to that of control, suggesting that the acidic pH contributed to inhibition in the main test.
72-h EC_{50} (biomass) = 14 mg A.I./L
72-h EC_{50} (growth rate = 16 mg A.I./L

Conclusion: The evaluation of available aquatic toxicity data for fish, aquatic invertebrates and aquatic plants indicates that the potential acute hazard of methane sulfonic acid to fish is low, to aquatic invertebrates is moderate, and to aquatic plants is low.

3. Human Health Effects

Acute Oral Toxicity

(1) Male and female rats (5/sex) were administered methane sulfonic acid via oral gavage at 300, 500 or 750 mg/kg-bw and were observed for 14 days. Most clinical abnormalities were observed in both the animals that died and those that survived to day 14 and included salivation, decreased activity, wobbly gait, breathing abnormalities, apparent hypothermia, decreased/no defecation, feces small in size, urine stain, hunched posture, unkempt appearance, rough haircoat, piloerection, extremities pale in color, dehydration, emaciation, distended abdomen, decreased food consumption and dark material around the facial area. Body weight loss was noted for one 300 mg/kg-bw male, one 500 mg/kg-bw male, two 500 mg/kg-bw females and one 750 mg/kg-bw male during the study day 0-7 body weight interval. Body weight loss was noted for one 300 mg/kg-bw male and one 750 mg/kg-bw male during the study day 7-14 body weight interval. Gross internal findings observed in the animals that died included distension/abnormal content/reddened mucosa in the digestive tract, dark red/mottled lungs, blackish-purple spleens, dark red lymph nodes, stained glandular mucosa in the stomach and body fat depletion/discoloration/adhesions in the abdominal cavity.
LD_{50} (male) > 750 mg/kg-bw
LD_{50} (female) $\leq$ 500 mg/kg-bw
LD_{50} (combined) = 649 mg/kg-bw

(2) Male and female rats (5/sex/dose) were administered methane sulfonic acid via oral gavage at 500, 1000 or 1500 mg/kg-bw and were observed for 14 days. Clinical abnormalities observed during the study included salivation, breathing abnormalities, wobbly gait, decreased activity, decreased defecation, rough haircoat, urine/fecal stain and dark material around the facial area. Body weight loss was noted for one 1000 mg/kg-bw male and one 1000 mg/kg-bw female during the study day 0-7 body weight interval and for one 300 mg/kg-bw male and one 1000 mg/kg-bw male during the study day 7-14 body weight interval. In animals that died, gross pathologic findings included dark red foci on the liver, blackish-purple spleens and abnormal content, reddened/thickened mucosa and discoloration in the digestive tract.
LD_{50} (male) $\leq$ 1000 mg/kg-bw
LD_{50} (female) $\leq$ 1500 mg/kg-bw
LD_{50} (combined) = 1157.5 mg/kg-bw

(3) Male rats (5 rats/dose; except 3 rats in lowest dose) were given administered methane sulfonic acid via oral gavage at 0.25, 0.5 or 1.0 mL/kg-bw (or 2000, 4000, or 8000 mg/kg-bw) and were observed for 5 days. All rats died by day 5. Sluggishness and unsteady gait were seen at all doses. At 1.0 mL/kg, deep breathing was immediately

observed. Findings at necropsy included: livers mottled and burned, stomach burned, pylorus hemorrhaged and gas filled, intestines hemorrhaged and gas filled, kidneys mottled and slightly congested.
$LD_{50} \geq 0.25$ mL/kg-bw or 2000 mg/kg-bw

Acute Dermal Toxicity

(1) New Zealand White rabbits (10) were treated with 1000 mg/kg-bw of methane sulfonic acid for 24 hours and observed for 14 days.
$LD_{50} > 1000$ mg/kg-bw

(2) Six albino rabbits were treated with 200 or 2000 mg/kg-bw of methane sulfonic acid for 24 hours. At the end of the exposure period, no systemic toxicity was observed. Two rabbits at 2000 mg/kg-bw died 28 hours after contact and an additional rabbit was euthanized 3 days after treatment for humane reasons. Severe dermal lesions were observed.
$200 < LD_{50} < 2000$ mg/kg-bw

Repeated-Dose Toxicity

Male and female rats (15/sex/dose) were exposed to methane sulfonic acid aerosol at concentrations of 0, 0.026, 0.073 or 0.242 mg/L for 6 hours/day, 5 days/week for 4 weeks. A 2-week recovery period followed exposure. A transient reduced mean body weight gain and slightly reduced food consumption was observed in 0.242 mg/L exposure level males. Exposure-related clinical signs included rales at 0.242 mg/L and increased incidence of yellow matting on body surfaces at 0.242 mg/L in both sexes and at 0.073 mg/L in males. Deaths occurred in 4, 1, 1 and 5 animals at 0, 0.026, 0.073 and 0.242 mg/L, respectively, but were attributed to confinement in the restraint tubes, rather than exposure to test substances. Histopathology revealed lesions in the nasal turbinates in all exposure groups indicative of portal-of-entry effects. During the two-week recovery (non-exposure) period the clinical signs and body weight gains were completely reversed; histopathology lesions in the nasal turbinates were observed in all groups at the end of the recovery period.
28-d LOAEL (systemic toxicity) = 0.073 mg/L (based on clinical signs)
28-d NOAEL (systemic toxicity) = 0.026 mg/L
28-d LOAEL (local irritation) = 0.026 mg/L (based on portal of entry effects such as lesions in the nasal turbinates)
28-d NOAEL (local irritation) = Not established

Reproductive Toxicity

In a combined reproductive/developmental toxicity screening test, Sprague-Dawley rats were administered methane sulfonic acid daily via gavage at 250, 500, or 1000 mg/kg-bw/day. Males were dosed four weeks prior to mating, two weeks during the mating period and until sacrifice. Females were dosed four weeks prior to mating, two weeks during the mating period, through gestation (3 weeks), lactation until day 4 post partum (pp) and until sacrifice (day 5 pp). No mortality was seen. Clinical signs in males included ptyalism (excessive salivation) at 1000 mg/kg-bw/day. There were no treatment-related effects on body weights, organ weight changes or histopathology. Methane sulfonic acid did not affect male and female reproductive performance or the progeny of the parental rats up to 1000 mg/kg-bw /day.
NOAEL (parental/reproductive toxicity) = 1000 mg/kg-bw/day (based on no effects at highest dose tested)

Developmental Toxicity

(1) Female rats (25/dose) were given daily oral gavage doses of methane sulfonic acid at 0, 25, 100 or 400 mg/kg-bw/day from gestation day 6 through 15 (GD 6-15). Based on the results of this study, the NOAEL was determined to be 400 mg/kg-bw/day for maternal toxicity and developmental toxicity.
NOAEL (maternal and developmental toxicity) = 400 mg/kg-bw/day (based on no effects at highest dose tested)

(2) Female rats (8/dose) were given daily oral gavage doses of the test substance at 0, 25, 50, 100, 200 or 300 mg/kg-bw/day from GD 5 through 15. Treatment-related clinical signs included rales, labored respiration and gasping in the 100, 200 and 300 mg/kg/day groups. Findings of red material around the nose and/or mouth in the

100, 200 and 300 mg/kg/day groups often correlated with occurrences of the aforementioned respiratory abnormalities. These findings appeared to be a function of the dosage concentration; rather than the dosage level, as they were observed with similar frequency in the 100, 200 and 300 mg/kg/day groups, each of which received the test article at a concentration of 50 mg/mL. Slight mean body weight losses and reduction in food consumption occurred in the 100, 200 and 300 mg/kg/day groups during GD 6-9 when evaluated on a group mean basis. Food consumption was slightly reduced in the 100, 200 and 300 mg/kg/day groups during GD 6-9 when the group means were compared with the control group mean. No effects on any other parameters were reported in the dams. No developmental toxicity was observed at dose levels up to 300 mg/kg/day.
LOAEL (maternal toxicity) = 100 mg/kg-bw/day (based on slight changes in body weight and food consumption)
NOAEL (maternal toxicity) = 50 mg/kg-bw/day
NOAEL (developmental toxicity) = 300 mg/kg-bw/day (based on no effects at highest dose tested)

Genetic Toxicity – Gene Mutation

In vitro
(1) In an Ames test, *Salmonella typhimurium* strains TA98, TA100, TA1535, TA1537 and TA1538 were exposed to 100, 500, 1000, 2500 or 5000 µg/plate methane sulfonic acid. No increase in revertant colonies was seen up to the cytotoxicity threshold (5000 µg/plate) in the presence or absence of metabolic activation. Response to positive controls was not indicated.
Methane sulfonic acid was not mutagenic in this assay.

(2) *Salmonella typhimurium* strains TA98, TA100, TA1535, TA1537 and TA1538 were exposed to 10, 32, 100, 316 or 1000 µg/plate methane sulfonic acid in the presence and absence of metabolic activation. Inhibition of growth, observed as thinning of the background lawn of non-revertant cells, and reduction in colony numbers occurred in all strains following exposure to 1000 µg/plate. Response to positive controls was not indicated.
Methane sulfonic acid was not mutagenic in this assay.

(3) *Salmonella typhimurium* strains TA100 and TA1535 were exposed to 384.4 to 12,300 µg/plate methane sulfonic acid in the presence and absence of metabolic activation. Positive controls produced an appropriate response.
Methane sulfonic acid was not mutagenic in this assay.

Genetic Toxicity – Chromosomal Aberrations

In vivo
Male and female mice (5/sex/dose) were administered 0, 20, 100 or 500 mg/kg-bw methane sulfonic acid by gavage for 24, 48, or 72 hours. From the protocol description, it is not clear if animals were dosed once or more than once. Three males at the 500 mg/kg-bw dose were excluded from the analysis because they died or were sacrificed prior to conclusion of the test. All surviving male mice of the 500 mg/kg-bw group showed piloerection; one animal also exhibited rales. One female also presented rales. The positive control produced a significant increase in micronucleated polychromatic erythrocytes. Methane sulfonic acid was negative for induction of micronuclei.
Methane sulfonic acid did not induce chromosomal aberrations in this assay.

Additional Information

Irritation

In a skin irritation study in mice, the tails of four anesthetized mice were immersed in methane sulfonic acid to a depth of 4 cm. Tissue reaction was terminated one hour later by plunging the appendages into a saturated solution of sodium bicarbonate for a period of 30 seconds. The tail of each mouse was white when exposure was terminated and the appendage fell off in a day or two. In an eye irritation study in rabbits, 0.1 ml of methane sulfonic acid was instilled in the eye. Each instillation caused excrutiating pain. The reaction involved all ocular tissues and occurred immediately. The conjunctivae became completely necrotic (white) without evident swelling. The iris was dilated with ragged edges and failed to react to light. The cornea opacified completely within 24 hours.
Methane sulfonic acid is corrosive to skin and highly corrosive to eyes.

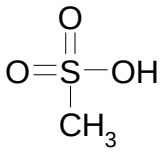
Skin Sensitization

Thirty guinea pigs were exposed dermally via topical application to 0.3 mL of methane sulfonic acid (treated group) or with the vehicle (control group) for 6 hours on day 1, day 7 and day 14. On day 28, all the animals received 0.3 mL of the test substance at the concentration of 25% in their right flank for 24 hours. None of the test animals responded with a skin grade that was suggestive of sensitization.
Methane sulfonic acid was not a skin sensitizer in this assay.

Conclusion: Methane sulfonic acid showed moderate acute oral toxicity to rats and moderate acute dermal toxicity to rabbits. Methane sulfonic acid is corrosive to mouse skin, extremely corrosive to the eye, but showed no evidence of dermal sensitization. Following repeated nose-only inhalation exposures in rats to low concentrations, clear evidence of portal-of-entry effects, such as histopathological lesions in the nasal turbinates were observed. No effects were seen for parental toxicity or reproductive performance in a combined reproductive/developmental toxicity screening test. Available prenatal developmental toxicity data showed some evidence of slight maternal toxicity but no developmental effects. Methane sulfonic acid was not mutagenic and did not induce chromosomal aberrations.

The potential health hazard of methane sulfonic acid is moderate based on portal-of-entry effects following repeated inhalation exposures.

APPENDIX

Summary Table of the Screening Information Data Set as Submitted under the U.S. HPV Challenge Program	
Endpoints	**SPONSORED CHEMICAL** **Methane sulfonic acid** **(75-75-2)**
Structure	
Summary of Environmental Effects – Aquatic Toxicity Data	
Fish **96-h LC_{50} (mg/L)**	73 mg A.I./L
Aquatic Invertebrates **48-h EC_{50} (mg/L)**	1.7 (24-h)
Aquatic Plants **72-h EC_{50} (mg/L)** **(growth)** **(biomass)**	 16 mg A.I./L 14 mg A.I./L
Summary of Human Health Data	
Acute Oral Toxicity **LD_{50} (mg/kg-bw)**	750 (male) $\leq$ 500 (female) 649 (combined)
Acute Dermal Toxicity **LD_{50} (mg/kg-bw)**	> 1000 mg/kg-bw
Repeated-Dose Toxicity **(mg/L/day)** **NOAEL/LOAEL**	NOAEL (systemic toxicity) = 0.026 (28-d) LOAEL (systemic toxicity) = 0.073 (28-d) NOAEL (local irritation) = Not established LOAEL (local irritation) = 0.026
Reproductive Toxicity **(mg/kg-bw/day)** **NOAEL/LOAEL** **Systemic/Reproductive Toxicity**	 NOAEL = 1000 (highest dose tested)
Developmental Toxicity **(mg/kg-bw/day)** **NOAEL/LOAEL** **Maternal Toxicity** **Developmental Toxicity**	 NOAEL = 50 LOAEL =100 NOAEL = 300 (highest dose tested)
Genetic Toxicity – Gene Mutation ***In vitro***	Negative
Genetic Toxicity – Chromosomal Aberrations ***In vivo***	Negative
Additional Information **Skin Irritation** **Eye Irritation** **Skin Sensitization**	 Corrosive Highly corrosive Not a skin sensitizer

Screening Level Exposure Characterization for HPV Challenge Chemical

Methane Sulfonic Acid

CAS # 75-75-2

July 2008

Prepared by

Exposure Assessment Branch
Chemical Engineering Branch
Economics, Exposure and Technology Division
Office of Pollution Prevention and Toxics
Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460-0001

Screening Level Exposure Characterization
Methane Sulfonic Acid (CAS # 75-75-2)

Non-CBI Executive Summary

Methane sulfonic acid (CAS # 75-75-2) has an aggregated production and/or import volume in the United States of 1 million to 10 million pounds.[12] Industrially, the chemical is processed as a reactant, incorporated into formulations, and used for a variety of functions, including in plating agents and metal surface treating agents, for electronic components manufacturing, in photosensitive chemicals, in soap and cleaning compound manufacturing, with solvents for cleaning or degreasing, among others. For commercial and consumer uses, the chemical is in electrical and electronic products, metal products, rubber and plastic products, and soaps and detergents.[13]

Potential Exposures to the General Population and the Environment. Based on the reported use information, it is likely that there would be some releases to water or air during manufacturing, processing, and use. A search of additional relevant databases provided further information on releases of this chemical. This chemical was found in measurable amounts in air, Antarctic ice, marine algae and salt marsh plants; the latter two are natural sources of dimethyl sulfide, which is photochemically oxidized to methane sulfonic acid.[14] Based on the totality of the information considered—known uses, chemical presence in monitoring data, and the Agency's expert judgment—EPA identifies, for purposes of risk-based prioritization, a high potential for exposure to the general population and the environment, although the degree of exposure that can be attributed to TSCA uses cannot be determined from the references examined.

Potential Exposures to Workers. Based on the totality of the information considered (primarily IUR data) in combination with Agency's professional judgment, EPA identifies, for the purposes of risk-based prioritization, a medium relative ranking for potential worker exposure. This relative ranking is based mainly on the corrosive and moisture sensitive nature of the chemical, which would likely require workers to wear adequate personal protective equipment (PPE) during exposures to the chemical in concentrated forms. The ranking is also based on uncertainty regarding the extent of PPE used by workers who may be exposed at lower concentrations. This chemical does not have OSHA Permissible Exposure Limits (PELs).

Potential Exposures to Consumers. Depending on the consumer product, there may be dermal and/or inhalation exposures to consumers from vapors, mists, or particulates. EPA identifies, for the purposes of risk-based prioritization, a high potential that consumers may be exposed to this chemical based on IUR data and information from public data sources that indicate this chemical is found in household products.

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[12] USEPA, 2006. Partial Updating of TSCA Chemical Inventory.
[13] USEPA, 2006. Partial Updating of TSCA Chemical Inventory.
[14] HSDB, 2008. Hazardous Substances Data Bank. http://toxnet.nlm.nih.gov/.

Potential Exposures to Children. No uses in products specifically intended to be used by children were reported in the IUR, nor were any found in other data sources. Exposures to children, however, may be expected to occur through the household use of some consumer products. Therefore, EPA identifies a medium potential that children may be exposed.

This draft exposure characterization was completed using both public, non-confidential sources, and one or more IUR submissions that were available as of this writing.

Volume and Use Information

Methane sulfonic acid (CAS # 75-75-2) has an aggregated production and/or import volume in the United States of 1 million to 10 million pounds.[15] Non-confidential information in the Inventory Update Rule (IUR) indicates that this chemical was manufactured and/or imported at the following companies and sites: Arkema Inc., Riverview, MI; The Dow Chemical Company, Freeport, TX; BASF Corporation, Florham Park, NJ; and Aceto Corporation, Lake Success, NY. There may be other companies and sites that are claimed confidential. Persons submitting IUR information for 2005 asserted that some or all of the information was confidential. Only non-confidential versions of reported IUR data are included in this summary.

According to IUR submissions, there are a variety of industrial processing and uses (IPUs), which are listed in Table 1 at the end of this summary. There are also several commercial and consumer uses, which are listed in Table 2 at the end of this summary.

The High Production Volume submission states that the chemical is used in chemical synthesis and as a basic industrial chemical.[16]

Another publicly available data source indicates that major uses of methane sulfonic acid are as a chemical intermediate, solvent, and catalyst in esterification, alkylation, olefin polymerization and peroxidation reactions.[17]

Exposures to Workers

Based on the totality of the information considered (primarily IUR data) in combination with Agency's professional judgment, EPA identifies, for the purposes of risk-based prioritization, a medium relative ranking for potential worker exposure. This relative ranking is based mainly on the corrosive and moisture sensitive nature of the chemical, which would likely require workers to wear adequate personal protective equipment (PPE) during exposures to the chemical in concentrated forms. The ranking is also based on uncertainty regarding the extent of PPE used by workers who may be exposed at lower concentrations. The following is a summary of relevant information affecting worker exposure.

[15] USEPA, 2006. Partial Updating of TSCA Chemical Inventory.
[16] USEPA, 2006. Partial Updating of TSCA Chemical Inventory.
[17] HSDB, 2008. Hazardous Substances Data Bank. Accessed, 4/4/08, methane sulfonic acid. http://toxnet.nlm.nih.gov/.

Summary of Parameters affecting Worker Exposure

Parameter	
Volume*	1 to 10 million pounds
Physical Form(s)*	dry powder, liquid
Vapor Pressure	4.28×10^{-4} torr
Concentration*	up to 100% by weight
Number of Industrial Workers*	1,000 or greater (see details below)
Uses*	See Tables 1 and 2
Key MSDS Info	Corrosive, sensitive to moisture

* Only non-confidential versions of reported IUR data are included in this summary.

Based on IUR data, the maximum total number of workers reasonably likely to be exposed to this chemical during manufacturing and industrial processing and use may be 1,000 or greater. There may be additional potentially exposed industrial workers that are not included in this estimate since not all submitters were required to report on industrial processing and use and there is at least one submission that contains a "Not Readily Obtainable" (NRO) response for number of workers for at least one use. This estimate does not include potentially exposed commercial workers. The National Occupational Exposure Survey (NOES), conducted from 1981 to 1983, estimated a total of 8,084 workers potentially exposed to this chemical.[18] Differences between numbers of workers estimated by IUR submitters and by the NOES are attributable to many factors, including time, scope, and method of the estimates. For example, NOES estimates are for all workplaces while IUR are for industrial workplaces only, and NOES used a survey and extrapolation method while IUR submitters simply provide their best estimates based on available information for the specific reporting year.

Based on IUR data, the chemical is manufactured in dry powder and liquid forms, and worker exposures are possible for this chemical in these forms. Also, the non-confidential maximum concentrations are up to 100% by weight at the manufacturing/ import sites and up to one percent by weight in commercial and consumer uses. There may be other physical forms and concentrations that are claimed as confidential business information (CBI). Experience has shown that use and handling of powders in workplaces may result in significant worker inhalation exposures to particulates. Dermal exposures are also possible to both the liquid and powder forms. This chemical has a vapor pressure of 4.28×10^{-4} torr.[19] Experience has shown that worker exposures to vapors have not been an issue for chemicals with vapor pressures below 0.001 torr. This chemical's vapor pressure is at a level at which worker exposures to vapors may be insignificant for most common handling of liquids at ambient conditions. Additional information on worker exposure is available in the Hazardous Substance Data Bank (HSDB).[20]

[18] NIOSH,1983. National Occupational Exposure Survey (NOES, 1981-1983). Accessed, 4/4/08. http://www.cdc.gov/noes/srch-noes.html.
[19] USEPA, 2008. Screening-Level Hazard Characterization for High Production Chemical, Methane Sulfonic Acid CAS No.: 75-75-2.
[20] HSDB, 2008. Hazardous Substances Data Bank. http://toxnet.nlm.nih.gov/.

This chemical does not have OSHA Permissible Exposure Limits (PELs).[21]

Environmental Releases

Environmental releases may impact general population and environmental exposures. Factors affecting releases include volumes produced, processed and used; numbers of sites; and, processes of manufacture, processing, and use.

Based on IUR data, the maximum total number of industrial sites from manufacturing, processing, or using this chemical is confidential. There are four non-confidential manufacturing sites and may be other confidential manufacturing sites. The number of industrial processing and use sites is confidential. This estimate does not include commercial sites that may use the chemical in pure form or as part of a mixture.

The following release statements are made based on inferences regarding the non-confidential use information reported in IUR and summarized in Tables 1 and 2 below.

Many chemicals processed as a reactant, incorporated into formulations, mixtures, or reaction products, or in repackaging only have industrial releases that are a relatively low percentage of the volume associated with these processing steps. Lower percentage releases occur when a high percentage of the chemical reacts without excess loss during its use as an intermediate. The actual percentage and quantity of release of the reported chemical associated with these processing steps are not known.

Many chemicals designated to have industrial use as plating agents and metal surface treating agents are used in aqueous processes and have releases to aqueous media. The actual percentage and quantity of release of the reported chemical associated with this industrial use are not known.

Many chemicals designated to have industrial use as solvents for cleaning or degreasing have industrial and/ or end use releases that are a relatively high percentage of their volume. Higher percentage releases occur when the chemical's intended use is as a solvent that may evaporate into the atmosphere or may be collected and disposed to water. In some cases, some engineering controls or capture for recycle or reclamation may reduce these losses. The actual percentage and quantity of release of the reported chemical associated with this industrial use is not known but could be high.

Chemicals designated to have industrial use as photosensitive chemicals, processing aids, and other industrial use can have variable release percentages during industrial processing and use. The actual percentage and quantity of release of the reported chemical associated with these industrial uses are not known.

Many chemicals designated to have commercial and consumer use as soaps and detergents have releases during end use that are a relatively high percentage of their volume. Higher percentage releases occur when the product containing the chemical is used in a cleaning product category

[21] NIOSH, 1988. OSHA PEL Project Documentation. Accessed 4/7/08. http://www.cdc.gov/niosh/pel88/npelcas.html.

that is often disposed to water. The actual percentage and quantity of release of the reported chemical associated with this use are not known but could be high.

Chemicals designated to have commercial and consumer use as electrical and electronic products, metal products, and rubber and plastic products can have variable release percentages during these uses. The actual percentage and quantity of release of the reported chemical associated with these uses are not known.

The chemical is not on the Toxics Release Inventory.[22] Additional release information can be found in the Hazardous Substance Data Bank.[23]

This chemical has a vapor pressure of 4.28×10^{-4} torr.[24] Experience has shown that air releases due to volatilization have not been an issue for chemicals with vapor pressures below 0.01 torr. This chemical's vapor pressure is at a level at which air releases may be insignificant for most common handling of liquids at ambient conditions.

Exposures to the General Population and the Environment

Based on the information under the release section above, it is likely that there would be some releases to water or air during manufacturing, processing, and use. A search of additional relevant databases provided further information on releases of this chemical. This chemical was found in measurable amounts in air, Antarctic ice, marine algae and salt marsh plants. It is formed naturally from the atmospheric photochemical oxidation of dimethyl sulfide, which comes from marine algae and salt marsh plants.[25]

EPA identifies, for the purposes of risk-based prioritization, a high potential that environmental release may occur and that the general population and the environment may be exposed due to the uses reported in the IUR data. These included electrical and electronic products, metal products, rubber and plastic products, and soaps and detergents.

Persistence and bioaccumulation ratings for this chemical are P1and B1. These ratings suggest that this chemical is neither persistent nor bioaccumulative in the environment.

Based on the totality of the information considered—known uses, chemical presence in monitoring data, and the Agency's expert judgment—EPA identifies, for purposes of risk-based prioritization, a high potential that the general population and the environment may be exposed. However, the degree of exposure that can be attributed to TSCA uses cannot be determined from the references examined.

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[22] USEPA, 2006. Toxics Release Inventory. Accessed 4/4/08. http://www.epa.gov/tri.
[23] HSDB, 2008. Hazardous Substances Data Bank: http://toxnet.nlm.nih.gov/.
[24] USEPA, 2008. Screening-Level Hazard Characterization for High Production Chemical, Methane Sulfonic Acid CAS No.: 75-75-2.
[25] HSDB, 2008. Hazardous Substances Data Bank: http://toxnet.nlm.nih.gov/.

Exposures to Consumers

Consumer uses are included in IUR data, and none of these are claimed confidential. Table 2 at the end of this summary lists these uses as electrical and electronic products, metal products, and rubber and plastic products.[26]

Depending on the consumer product, there may be dermal and/or inhalation exposures to consumers from vapors, mists, or particulates. EPA identifies, for the purposes of risk-based prioritization, a high potential that consumers may be exposed through products containing this chemical based on IUR data and information from public data sources that indicate this chemical is found in household products.

Exposures to Children

No uses in products intended to be used by children were reported in the IUR, nor were any found in other data sources. Exposures to children, however, may be expected to occur through the household use of some consumer products. Therefore, EPA identifies a medium potential that children may be exposed.

[26] USEPA, 2006. Partial Updating of TSCA Chemical Inventory.

Non Confidential IUR Data Summary

Manufacturing/ Import Information

Production and import volume:	1 million -10 million lbs
List of non-CBI companies/ sites:	Arkema Inc. / Riverview, MI Aceto Corp. / Lake Success, NY BASF Corp. / Florham Park, NJ Dow Chemical Co. / Freeport, TX
Highest non-CBI maximum concentration:	up to 100%
Non-CBI physical forms:	dry powder, liquid

Table 1
Industrial Processing and Use
Information Reported in 2006 IUR

Processing Activity	Industrial Sector	Function in Ind. Sector
Processing as a reactant	Other Basic Organic Chemical Manufacturing	Other
Processing as a reactant	Other Basic Organic Chemical Manufacturing	Plating agents and metal surface treating agents
Processing as a reactant	Semiconductor and Other Electronic Component Manufacturing	Plating agents and metal surface treating agents
Processing--incorporation into formulation, mixture, or reaction product	Other Basic Organic Chemical Manufacturing	Photosensitive chemicals
Processing--incorporation into formulation, mixture, or reaction product	Soap and Cleaning Compound Manufacturing	Solvents (for cleaning or degreasing)
Processing--repackaging	Other Basic Organic Chemical Manufacturing	Other
Use--nonincorporative activities	All Other Chemical Product and Preparation Manufacturing	Processing aid, not otherwise listed
Use--nonincorporative activities	Semiconductor and Other Electronic Component Manufacturing	Solvents (for cleaning or degreasing)
Claimed as CBI		

Table 2
Commercial/ Consumer Uses
Information Reported in 2006 IUR

Commercial/ Consumer Product Category Description	Highest maximum concentration range	Use in Children's Products
Electrical and electronic products	Less than 1%	No
Metal products	Less than 1%	No
Rubber and plastic products	Less than 1%	No
Soaps and detergents	Less than 1%	No
Claimed as CBI		