Substance Profile for The Challenge
Acetic acid ethenyl ester
(Vinyl Acetate)
CAS No. 108-05-4

Introduction

The *Canadian Environmental Protection Act, 1999* (CEPA 1999) required the Minister of Health and Minister of the Environment to categorize the approximately 23 000 substances on the Domestic Substances List (DSL). Categorization involved identifying those substances on the DSL that are a) considered to be persistent (P) and/or bioaccumulative (B), based on criteria set out in the *Persistence and Bioaccumulation Regulations* (Government of Canada, 2000), and "inherently toxic" (iT) to humans or other organisms, or b) that present, to individuals in Canada, the greatest potential for exposure (GPE).

Further to this activity, the Act requires the Minister of the Environment and the Minister of Health to conduct screening assessments of substances that meet the categorization criteria. A screening assessment involves a scientific evaluation of available information for a substance to determine whether the substance meets the criteria set out in section 64 of CEPA 1999. Based on the results of a screening assessment, the Ministers can propose taking no further action with respect to the substance, adding the substance to the Priority Substances List (PSL) for further assessment or recommending the addition of the substance to the List of Toxic Substances in Schedule 1 of CEPA 1999 and, where applicable, the implementation of virtual elimination of releases to the environment.

A number of substances have been identified by the Ministers as high priorities for action based on the information obtained through the categorization process. This includes substances:

- that were found to meet all of the ecological categorization criteria, including persistence, bioaccumulation potential and inherent toxicity to aquatic organisms (PBiT), and that are known to be in commerce, or of commercial interest, in Canada, and/or
- that were found either to meet the categorization criteria for GPE or to present an intermediate potential for exposure (IPE), and were identified as posing a high hazard to human health based on available evidence on carcinogenicity, mutagenicity, developmental toxicity or reproductive toxicity.

Based on a consideration of the ecological and/or human health concerns associated with these substances, and the requirement under section 76.1 of CEPA 1999 for the Ministers to apply a weight of evidence approach and the precautionary principle when conducting and interpreting the results of an assessment, sufficient data are currently available to

conclude whether these substances as meeting the criteria under Section 64 of CEPA 1999.

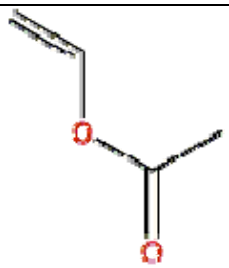
As such, the Ministers have issued a Challenge to industry and other interested stakeholders through publication in Canada Gazette Part I December 9, 2006 to submit, within the timelines stated in the Challenge section of this document, below, specific information that may be used to inform risk assessment and to develop and benchmark best practices for risk management and product stewardship.

The substance acetic acid ethenyl ester was identified as a high priority for action as it was determined to have a high potential for exposure to individuals in Canada (GPE), and is considered to present a high hazard to human health. The technical human health and ecological information, that formed the basis for concern associated with this substance, is contained in Appendices I and II, respectively.

Substance Identity

For the purposes of this document, this substance will be referred to as vinyl acetate.

CAS Registry Number	108-05-4
Inventory names	Acetic acid ethenyl ester
Other names	Acetic acid ethenyl ester (TSCA, DSL, SWISS, PICCS, ASIA-PAC) Acetate de vinyle (French) (DSL, EINECS) vinyl acetate (EINECS, ENCS, ECL, TAIWAN) Vinylacetat (German) (EINECS) acetato de vinilo (Spanish) (EINECS) Acetic acid, ethenyl ester (AICS) ESSIGSAEURE-VINYLESTER (German) (SWISS) ACETATE, ETHENYL (PICCS) ACETATE, VINYL (PICCS) VINYL ACETATE MONOMER (PICCS) Acetic acid vinyl ester (PICCS) 1-Acetoxyethylene Acetoxyethene Acetoxyethylene Ethenyl acetate NSC 8404 Ponal UN 1301 UN 1301 (DOT) VAM
Chemical group	Organics
Chemical sub-group	Esters
Chemical formula	$C_4H_6O_2$

Chemical structure	
SMILES	O=C(OC=C)C
Molecular mass	86.09 g/mol

Based on information submitted by the 11 companies that notified this substance to the Domestic Substances List, approximately 30,100,000 kg of vinyl acetate were in commerce in 1986 for a variety of uses, including the categories of abrasives, adhesives/binder/filler, formulation component, fragrance/perfume/deodorizer/flavouring agent, monomer, paint/coating additives, construction materials, metallurgical, industrial organic chemicals, paint and coating, plastics, plastic and synthetic resins and pulp and paper.

Other potential uses in Canada include the manufacture of plastic masses, films and lacquers, as an intermediate in the production of emulsion paint substances and to create safety glass inter-layers. Another application is as a chewing gum base. Vinyl acetate is also used as a softener in the manufacturing of rubber. May be used as a coating or as part of a coating that is used in plastic films for food packaging and as a modifier of food starch.

THE CHALLENGE

Respecting direction under section 76.1 of CEPA 1999, and in the absence of additional relevant information as a result of this Challenge, the Ministers are predisposed to conclude, based on a screening assessment, that this substance satisfies the definition of toxic under section 64 of CEPA 1999. As such, the Ministers are prepared to then recommend to the Governor in Council that this substance be added to the List of Toxic Substances in Schedule 1 of CEPA 1999, with the intent of initiating the development of risk management measures taking into account socio-economic considerations.

If it is determined that the substance meets the virtual elimination criteria in subsection 77(4) of CEPA 1999, then subsequent risk management activities will be based on the objective of eliminating the release of any measurable quantity of the substance to the environment. In the absence of further information on existing management practices for a substance, actions would be proposed based on the assumption of worst-case practices. The management actions being considered for such substances at this time include prohibition through regulations, of the manufacture, use, sale, offer for sale and import of this substance, except for those activities controlled under the *Pest Control Products Act* and/or the *Food and Drugs Act.*

Exceptionally, should no information be identified to indicate that this substance is in commerce in Canada, the Ministers will conclude, based on a screening assessment, that this substance does not satisfy the definition of toxic under section 64 of CEPA 1999. However, given the properties of this substance, there is concern that new activities for the substance that have not been identified or assessed under CEPA 1999 could lead to the substance meeting the criteria set out in section 64 of the Act. Therefore it would be recommended that this substance be subject to the Significant New Activity provisions specified under subsection 81(3) of the Act, to ensure that any new manufacture, import or use of this substance in quantities greater than 100 kg/year is notified, and that ecological and human health risk assessments are conducted as specified in section 83 of the Act prior to the substance being introduced into Canada.

Section 71 Notice

Under the Challenge, information deemed necessary for improved decision making may be gathered by the Minister of Environment using section 71 of CEPA 1999. This information may be used for the purpose of assessing whether a substance is toxic or is capable of becoming toxic as defined under section 64 of CEPA 1999, or for the purpose of assessing whether to control, or the manner in which to control a substance.

The information mandated through the notices may relate to, among other things; quantity of the substance imported, manufactured, used, or released, concentrations, suppliers, customers, as well as types of uses of the substance.

Copies of the section 71 notice and guidance on how to comply with it are available from the Government of Canada Chemicals Portal (www.chemicalsubstanceschimiques.gc.ca), or from the contact provided below.

Opportunity to Submit Additional Information to Inform Screening Assessment

The Ministers of Health and Environment are inviting the submission of additional information for consideration during screening assessment of this substance. Data of the types described in the following paragraphs are considered most relevant, although other submitted information will be considered.

Data on the persistence, bioaccumulation, and potential for toxicity of the substance to organisms in different environmental media – Through the categorization exercise, available experimental data were collected up to December 2005. Where acceptable experimental data were not available, Quantitative Structure Activity Relationships (QSARs) or read across data were used to fill the data gaps. Since experimental data are preferred, interested parties have an opportunity to provide new or additional relevant experimental study information on the persistence, bioaccumulation, and potential for toxicity of this substance to organisms in different environmental media (air, water, sediment, soil). Efforts should focus on providing data for the endpoints for which quality experimental data does not already exist, as demonstrated by the information summarized in Appendix II of this document. As submitted data will be evaluated for completeness and robustness, it is recommended that stakeholders follow the guidance for test protocols and alternative approaches for test data, as described in Section 8 of the "Guidelines for the Notification and Testing of New Substances: Chemicals & Polymers".[1]

Data on the toxicity of the substance to human health - Through the categorization exercise, the high health priorities for action were those substances identified by various agencies as representing a high health hazard on the basis of potential to induce cancer, and/or adversely affect reproduction and development, two critical determinants of the health of Canadians of all ages. The hazard classifications used were those developed by national or international agencies in which large numbers of substances have been classified for endpoint-specific hazard based on original review and critical evaluation of data, assessments of weight of evidence and extensive peer review. Interested parties have an opportunity to provide new or additional relevant experimental study information on the toxicity of the substance to human health which could inform the screening assessment.

Responses to this part of the challenge for this substance should be received at the address provided below by November 13, 2007.

[1] "Guidelines for the Notification and Testing of New Substances: Chemicals & Polymers (version 2005)", Government of Canada, Available from http://www.ec.gc.ca/substances/nsb/eng/cp_guidance_e.shtml

Opportunity to Submit Additional Information on Current Uses and Existing Control Measures to Inform the Risk Management Approach for this Substance

The Ministers of Health and Environment are inviting the submission of additional information that is deemed beneficial by interested stakeholders, relating to the extent and nature of the management/stewardship of substances listed under the Challenge.

Organizations that may be interested in submitting additional information in response to this invitation include those that manufacture, import, export or use this substance whether alone, in a mixture, in a product or in a manufactured item.

Submission of additional information is being invited in the following areas:

- Import, manufacture and use quantities
- Substance and product use details
- Releases to the environment and spill management
- Current and potential risk management and product stewardship actions
- Existing legislative or regulatory programs controlling/managing the substance
- Information to support the development of a regulatory impact assessment.

A questionnaire is available which provides a detailed template as an example for the submission of this information. Guidance on how to respond to the challenge questionnaire is also available. Interested stakeholders are invited to provide available additional information, recognizing that not all questions in the questionnaire may be relevant to a particular substance, use, or industrial sector.

Copies of the questionnaire and associated guidance are available from the Government of Canada Chemicals Portal (www.chemicalsubstanceschimiques.gc.ca)**,** or from the contact provided below.

Responses to the questionnaire should be received at the address provided below by November 13, 2007.

Request for Documents and Submission of Information

Documents and instructions may be requested from the following contact. Information in response to the above Challenge must be submitted to this address.

DSL Surveys Coordinator
Place Vincent Massey, 20th Floor
351 Saint Joseph Boulevard
Gatineau QC K1A 0H3
Tel: 1-888-228-0530 / 819-956-9313

Fax: 1-800-410-4314 / 819-953-4936
Email: DSL.surveyco@ec.gc.ca

Appendix I
Human Health Information to Support the Challenge for Acetic acid ethenyl ester (Vinyl acetate) CAS No. 108-05-4

Introduction

Under the *Canadian Environmental Protection Act, 1999* (CEPA, 1999), Health Canada undertook to categorize all substances on the Domestic Substances List (DSL) to identify those representing the greatest potential for human exposure (GPE) and those among a subset of substances considered persistent (P) and/or bioaccumulative (B) that are also considered to be "inherently toxic" to humans.

In order to efficiently identify substances that represent the highest priorities for screening assessment from a human health perspective, Health Canada developed and applied a Simple Exposure Tool (SimET) to the DSL to identify those substances that meet the criteria for GPE, Intermediate Potential for Exposure (IPE) or Low Potential for Exposure (LPE), and a Simple Hazard Tool (SimHaz) to identify those substances that pose a high or low hazard.

Vinyl acetate is considered to meet the criteria for GPE under SimET and for high hazard under SimHaz. This document summarizes the currently available information used to support the inclusion of this substance in the Challenge.

Exposure Information from Health Related Components of DSL Categorization

SimET was developed and used to identify substances on the DSL considered to represent GPE. This approach was based on three lines of evidence: 1) the quantity in commerce in Canada, 2) the number of companies involved in commercial activities in Canada (i.e., number of notifiers), and 3) the consideration by experts of the potential for human exposure based on various use codes. The proposed approach was released for public comment in November 2003 and also enabled designation of substances as presenting an Intermediate (IPE) or Lowest Potential for Exposure (LPE), based on criteria for quantity and nature of use (Health Canada, 2005).

Results of the Application of SimET

Vinyl acetate has been determined to be GPE based on a consideration of the DSL nomination information listed below.

Nomination Information for DSL

Quantity in Commerce

The quantity reported to be manufactured, imported or in commerce in Canada during the calendar year 1986 was 30,100,000 kg.

Number of Notifiers

The number of notifiers for the calendar years 1984-1986 was 11.

Use Codes and Description

The following DSL use codes have been identified for the substance:

03 Abrasive
04 Adhesive/ Binder/ Sealant/ Filler
21 Formulation component
22 Fragrance/ Perfume/ Deodorizer/ Flavouring agent
28 Monomer
30 Paint/ Coating Additives
51 Function other than that listed in codes 02-50
52 Adhesive and Sealant Production
59 Construction Materials
71 Metallurgical
76 Organic Chemicals, Industrial
80 Paint and Coating
86 Plastics
87 Plastics and Synthetic Resins
90 Pulp and Paper

Section 71 Results from 2000 Survey

A section 71 survey has yet to be performed for CAS No. 108-05-4, vinyl acetate.

Potential Uses in Canada

The additional information below on potential uses of vinyl acetate was identified through searches of the available scientific and technical literature.

Vinyl acetate is produced by reacting ethylene with acetic acid and oxygen in the presence of a palladium catalyst. Vinyl acetate is commonly referred to as vinyl acetate monomer (VAM).

Vinyl acetate is used as a monomer in the synthesis of polyvinyl acetate, polyvinyl alcohols and other polymers and copolymers e.g. ethylene vinyl acetate. It is used in the manufacture of plastic masses, films and lacquers. It is used as an intermediate in the

production of emulsion paint substances. Vinyl acetate is used to create safety glass inter-layers. Poly(vinyl acetate) and vinyl acetate copolymers are used in the manufacture of water-based paints, adhesives, paper coatings or as impregnation agents as coatings for non-woven binders, for fibrous materials, pulp and paper products. Vinyl acetate can be copolymerized as the minor constituent with vinyl chloride and with ethylene to form commercial polymers and with acrylonitrile to form acrylic fibers. Another application is as a chewing gum base. Vinyl acetate is also used as a softener in the manufacturing of rubber. May be used as a coating or as part of a coating that is used in plastic films for food packaging and as a modifier of food starch (Scorecard; Spectrum; NLM, 2005).

Consumers are potentially exposed via inhalation, dermal and oral routes of exposure. Potential sources of exposure from consumer products include glues, insulating aerosol foam sealants, liquid caulking, spackling, bonding adhesives, paints, textiles, paper coatings, direct and indirect food additives (Vinyl Acetate Council; US FDA, 2006).

Hazard Information from Health Related Components of DSL Categorization

Simple Hazard Tool (SimHaz)

SimHaz is a tool that has been used to identify, among all of the approximately 23 000 substances on the DSL, those considered to present either high or low hazard to human health based on formalized weight of evidence criteria and/or peer review/consensus of experts. This tool has been developed through extensive compilation of hazard classifications of Health Canada and other agencies and consideration of their robustness based on availability of transparent documentation of both process and criteria (Health Canada, 2005).

Results of the Application of SimHaz

Vinyl acetate is considered to be a potentially high hazard substance based on its classification for carcinogenicity by the International Agency for Research on Cancer (IARC).

IARC has classified vinyl acetate as Group 2B for carcinogenicity (possibly carcinogenic to humans). IARC noted that there is inadequate evidence for the carcinogenicity of vinyl acetate in humans, but there is sufficient evidence for the carcinogenicity of vinyl acetate in experimental animals (IARC, 1995).

The IARC Working group considered the following evidence when making their overall conclusion. Vinyl acetate is rapidly transformed into acetaldehyde in human blood and animal tissues and there is sufficient evidence for the carcinogenicity of acetaldehyde in experimental animals. Vinyl acetate and acetaldehyde induce nasal cancer in rats after administration by inhalation and both are genotoxic in human cells *in vitro* and in animals *in vivo* (IARC, 1995).

Uncertainties

SimET and SimHaz have been developed as robust tools for effectively identifying substances from the DSL that are considered to be human health priorities for further consideration. It is recognized that they do not include a number of elements normally considered in a human health risk assessment such as a comprehensive characterization of exposure and hazard, a comparison of exposure metrics to hazard metrics and a detailed analysis of uncertainties; however, as a result of the combination of the severe hazard properties of these substances and their high potential for exposure to humans, evaluation of the need for preventative and protective actions is required.

References

Health Canada. 2005. Proposed Integrated Framework for the Health-Related Components of Categorization of the Domestic Substances List under CEPA 1999 http://www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/contaminants/existsub/framework-int-cadre_e.pdf

IARC. 1995. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Volume 63. Vinyl Acetate. World Health Organization. International Agency for Research on Cancer. Lyon, France. Vinyl Acetate. pp. 443. http://monographs.iarc.fr/ENG/Monographs/vol63/volume63.pdf

National Institute of Health National Library of Medicine Specialized Information Services Household Products Database http://hpd.nlm.nih.gov/cgi-bin/household/brands?tbl=chem&id=571&query=108-05-4

NLM, NIH Hazardous Substances Data Bank. 2005. Vinyl Acetate. HSDB record 190. National Library of Medicine, National Institutes of Health. http://toxnet.nlm.nih.gov/

Scorecard website. The Pollution Information Site. Chemical Profiles. http://www.scorecard/org/chemical-profiles/uses.tcl?edf_substance_id=108%2d05%2d4

Spectrum Chemical fact sheet. 108-05-4. Spectrum Laboratories. Ft. Lauderdale, FL. http://www.speclab.com/compound/c108054.htm

U.S. FDA. Center for Food Safety and Applied Nutrition. EAFUS database http://www.cfsan.fda.gov/~dms/eafus.html

U.S. FDA. 2006. Center for Food Safety and Applied Nutrition. List of indirect food additives. http://www.cfsan.fda.gov/~dms/opa-indt.html

Vinyl acetate council's website. http://www.vinylacetate.org/what.shtml

Appendix II
Ecological Information
to Support The Challenge for
Acetic Acid Ethenyl Ester
(Vinyl Acetate)
CAS No. 108-05-4

Introduction

The information in this document will form the basis of a screening assessment under section 74 of CEPA, 1999. Data relevant to an ecological screening assessment were identified in original literature, review documents, commercial and government databases prior to December 2005. Properties and characteristics may also have been estimated using Quantitative Structure Activity Relationship (QSAR) models.

Physical and Chemical Properties

Tables 1a and 1b contain experimental and modelled physical-chemical properties of vinyl acetate which are relevant to its environmental fate.

Table 1a. Experimental physical and chemical properties for vinyl acetate.

Property	**Type**	**Value**	**Temperature (°C)**	**Reference**
Melting point (°C)	Experimental	-93.2 -93.2		SRC PHYSPROP Database 2003 Howard, 1989
Boiling point (°C)	Experimental	72.5		SRC PHYSPROP Database 2003
Vapour pressure (Pa)	Experimental	11332 (85.0 mm Hg) 12020 (90.16 mm Hg)	20	Howard, 1989 Daubert and Danner, 1985
Henry's Law Constant (Pa-m^3/mol)	Experimental	50.11 (0.00051 atm-m^3/mol)		VP/WSOL
Log Kow (Octanol-water partition coefficient)	Experimental	0.73 0.73		Howard 1989 Hansch et al., 1995

(dimensionless)				
Water solubility (mg/L)	Experimental	2000	15-25	Riddick et al., 1986

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Table 1b: Modelled physical and chemical properties for vinyl acetate

Property	Value	Temperature	Reference
Melting Point	-83.5		MPBWIN v1.41
Boiling point (°C)	76.05		MPBPWIN v1.41
Vapour pressure (Pa)	15865.36 (119 mm Hg)	25	MPBPWIN v1.41
Water solubility (mg/L)	30250		WSKOWWIN v1.41
Henry's Law Constant ($Pa \cdot m^3/mol$)	29.51 – 114.34 (0.000300 – 0.00116 atm-m^3/mol)		HenryWin v3.10
Log Kow (Octanol-water partition coefficient) (Dimensionless)	0.73		KOWWIN v1.67
Log Koc (Organic carbon partition coefficient) (Dimensionless)	0.788		PCKOCWIN v1.66

Manufacture, Importation, and Uses

Available information is presented in Appendix I.

Releases, Fate and Presence in the Environment

Refer also to Appendix I.

Releases

The substance, vinyl acetate is not naturally produced in the environment. Based on the physical and chemical properties of vinyl acetate, the likely compartments of release will be to the atmosphere and water.

The National Pollutant Release Inventory (NPRI) has tracked the release of vinyl acetate from industrial facilities in Canada since the 1990's. Total releases to air, and land appear to have reached a peak in 1999-2000 and have remained stable from 2001 to 2005 (Table 2). In addition, it should also be acknowledged that only facilities that meet established reporting criteria are required to report to the NPRI.

Table 2. Reports of NPRI releases for vinyl acetate

Year	Releases to Air	Releases to Land	Releases to Water	Total On-Site Releases (tonnes)
2005	136	1		137
2004	129	1		130
2003	136	1		137
2002	131	0.01		131
2001	146	0.01		146
2000	181	0.02		181
1999	206	0.3		206
1998	139	0.6		140
1997	145	0.1		145
1996	134	0.1		134
1995	85	0.6		86
1994	117.7	0.7		118

Fate

Aquatic fate

Vinyl acetate is expected to exhibit moderate volatilization from water, based on an experimental Henry's Law constant of 50 Pa·m^3/mol. Results from the Level III Fugacity Model indicate that vinyl acetate is expected to remain mainly in the compartment to which it is released (Table 3). In water, vinyl acetate is expected to biodegrade (82-98% over a 14 day period). Vinyl acetate is also expected to degrade in natural water by hydrolysis (half-life of 7.3 days). If released to water, vinyl acetate is not expected to sorb to sediments or suspended solids based on its low predicted Log Koc values (Table 1b).

Table 3: Results of the Level III fugacity modelling for vinyl acetate (EPIWIN V3.12)

	Fraction of Substance Partitioning to Each Medium (%)			
Substance Released To:	**% in Air**	**% in Water**	**% in Soil**	**% in Sediment**
-Air (100%)	96.3	3.43	0.29	0.01
- Water (100%)	1.93	97.9	0.01	0.19
- Soil (100%)	5.92	12.6	81.5	0.02
- Air, water, soil (33% each)	6.46	60.2	33.2	0.12

Atmospheric fate

Vapour pressures of 11332-12020 Pa indicate that vinyl acetate is highly volatile. In air, vinyl acetate was degraded by atmospheric oxidation in 0.43 days and by ozone in 3.58 days (Table 4a**).** If released to air, it will remain in this compartment (96.3%) (Table 3).

Terrestrial Fate

If released to soil, a modelled log Koc value (0.788) indicates that there would be low to negligible sorption of vinyl acetate (i.e., it is expected to be highly mobile). Based on the Henry's Law constant of 50.11 Pa-m^3/mol, a moderate volatilization capacity is expected of this chemical. The substance's vapour pressures of 11332-12020 Pa indicate that evaporation from dry soils is likely to occur.

According to predicted results based on the Japanese MITI test (BIOWIN v4.02 (MITI Non-linear)), vinyl acetate shows high probability of biodegradation in soil (0.9303). If released to soil, vinyl acetate will remain in this environmental compartment (81.5%), with some partitioning to water (12.6) as illustrated by the Level III Fugacity results in Table 3.

Presence in the Environment

No monitoring data relating to the presence of this substance in environmental media (air, water, soil, sediment) have yet been identified.

Evaluation of P, B and iT Properties

Environmental Persistence

Once released to the environment, vinyl acetate is degraded rapidly by reaction with hydroxyl radicals in the atmosphere (half-life of 0.427 days) (Table 4a). Reaction with other photo oxidative species in the atmosphere, such as O_3, also occurs in 3.58 days experimentally (Table 4a) (Atkinson1989) and 6.5 days under modeled conditions (Table 4b) (AOPWIN v1.91).

If released to water, degradation by hydrolysis will take place (half-life of 7.3 days; Mabey and Mill 1978) and hydrolysis will likely be a significant process for vinyl acetate in moist soils. Although the estimated Log Koc of 0.788 indicates that significant leaching will occur, concurrent hydrolysis should decrease the environmental importance of leaching.

The empirical biodegradation data (MITI 1992), show 82-98% biodegradation over 14 days in a ready-biodegradation test for vinyl acetate (Table 4a). This indicates that the half-life in water and soil is less than 182 days. Modelled biodegradation data (BIOWIN v4.02), show a half-life of 15 days in the ultimate survey method for water/soil.

To extrapolate to a half-life in sediments, an approach has been developed using Boethling's extrapolation factors (BIOWIN v4.02), which involves estimating the half life in sediment from that estimated for water and soil ($t_{1/2\ water}$: $t_{½soil}$:$t_{1/2\ sediment}$ = 1:1:4) Boethling et al. 1995). Resulting half-lives for sediment range from 28-60 days.

Table 4a. Experimental persistence values for vinyl acetate

Medium	Fate Process	Degradation Value	Endpoint/Units	Reference
Air	Atm. Oxidation (O3)	3.5807	Half-life, days	Atkinson, 1989
Air	Atm. Oxidation (OH)	0.427	Half-life, days	Atkinson, 1989
Water	Hydrolysis	7.3	Half-life, days	Mabey and Mill, 1978
Water	Biodegradation	82-98	% biodegradation	Chemicals Inspection and Testing Institute 1992

Table 4b. Modeled persistence values for vinyl acetate

Medium	Fate Process	Degradation Value	Endpoint/Units	Reference
Air	Atm. Oxidation (OH)	0.4059	Half-life, days (12 hour)	AOPWIN v1.91
Air	Ozone reaction	6.5459	Half-life, days	AOPWIN v1.91

Water/Soil	Biodegradation	15	Half-life, days	BIOWIN v4.02, Ultimate survey
Water/Soil	Biodegradation	0.9972	Probability	BIOWIN v4.02, Non-linear Probability
Water/Soil	Biodegradation	0.8187	Probability	BIOWIN v4.02 (MITI Linear)
Water/Soil	Biodegradation	0.8807	Probability	BIOWIN v4.02 (Linear)
Water/Soil	Biodegradation	0.9303	Probability	BIOWIN v4.02 (MITI Non-linear)
Water	Hydrolysis	141.6	Half-life, days	HYDROWIN v1.67

The empirical and modelled data (Tables 4a and 4b) demonstrate that vinyl acetate does not meet the persistence criteria as set out in the Persistence and Bioaccumulation Regulations (Government of Canada, 2000).

Potential for Bioaccumulation

No experimental bioaccumulation results are available for vinyl acetate. Modelled bioaccumulation factor (BAF) values (Modified GOBAS BAF T2MTL = 1.27 L/kg), the OASIS BCF max (15.47 L/kg), BCFWIN values v2.15 (3.16 L/kg) and the Log Kow of 0.73, indicate that this chemical does not have the potential to bioaccumulate in the environment (Table 5).

Table 5. Modelled data for bioaccumulation

Test Organism	Endpoint	Value wet wt	Reference
Fish	BAF	1.2760 L/kg	Modified GOBAS BAF T2MTL
Fish	BCF	1.1220 L/Kg	Gobas BCF 5% T2LTL
Fish	BCF	15.47 L/kg	OASIS BCF max
Fish	BCF	3.16 L/kg	BCFWIN v2.15

The modelled bioaccumulation values do not take into account the metabolism potential of the substance.

The weight of evidence indicates that the substance does not meet the bioaccumulation criterion (BCF, BAF > 5000) as set out in the Persistence and Bioaccumulation Regulations (Government of Canada, 2000).

Ecological Effects

A - In the Aquatic Compartment

Experimental ecotoxicological data (Tables 6a) provide evidence that at levels ranging from the 14 mg/L for fathead minnow (Pickering and Henderson 1964) to 330 mg/L for daphnia (Ecotox), vinyl acetate is expected to have moderate to low potential to harm aquatic organisms in acute exposures.

Table 6a Empirical data for aquatic toxicity

Test Organism	Type of Test	Endpoint	Value (mg/L)	Reference
Fish	Acute	LC_{50}	14 to >100	Pickering and Henderson, 1964; ECOTOX database
Daphnia	Acute	EC_{50}/LC_{50}	52 - 330	ECOTOX database
Algae	N/A	LOEC	35 - 370	ECOTOX database

Table 6b Modelled data for aquatic toxicity

Test Organism	Type of Test	Endpoint	Value (mg/L)	Reference
Fish	Acute	LC_{50}	0.795 62.3 NP 92.5 30.5	Topkat; ECOSAR; OASIS; ASTER AI Expert
Fish	Chronic	14-day	1476	ECOSAR
Daphnia	Acute	EC_{50}	21	TOPKAT
Daphnid	Acute	LC_{50}	979	ECOSAR
Algae	Acute	EC_{50}	NP	ECOSAR

NP = Not predictable or not a reliable prediction

A range of aquatic toxicity predictions were obtained from the various QSAR models considered. Table 6b list those predictions that were considered reliable and were used in the QSAR weight-of-evidence approach for aquatic toxicity (ESD 2006a). These results indicate that the modelled data support the results of the experimental toxicity data, exhibiting moderate to low toxicity to aquatic organisms (i.e. acute LC/EC_{50} to >1 to >100 mg/L) .

B - In Other Media

No effects studies for non-aquatic non-human organisms have yet been identified for this compound.

Potential to Cause Ecological Harm

Based on the available information, vinyl acetate does not persist in the environment and is not bioaccumulative based on criteria defined in the Persistence and Bioaccumulation Regulations (Government of Canada, 2000). Available ecotoxicty data indicate that vinyl acetate poses a moderate to low acute hazard to aquatic organisms. Information on concentrations of vinyl acetate in the environment has not been identified at this time. Information on potential impacts in other environmental compartments has not been identified.

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