FOREWORD INTRODUCTION

TRIS(1-CHLORO-2-PHOSPHATE)PHOSPHATE

CAS N°: 13674-84-5

SIDS INITIAL ASSESSMENT PROFILE

CAS NO.	**13674-84-5**
CHEMICAL NAME	**Tris (1-chloro-2-propyl) phosphate**
STRUCTURAL FORMULA	**$C_9H_{18}Cl_3O_4P$**

RECOMMENDATION OF THE SPONSOR COUNTRY

(x) presently of low priority for further work.

( ) requiring further information to assess identified concerns

( ) candidate for in-depth risk assessment with a view to possible risk reduction activities

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SHORT SUMMARY OF THE REASONS WHICH SUPPORT THE RECOMMENDATION

Environment

Tris (1-chloro-2-propyl phosphate (TCPP) has low volatility at ambient temperature and pressure and is produced in a closed system, therefore, exposure to the environment is expected to be minimal. In addition, exposure to the environment during the processing of the chemical as a flame retardant in rigid and flexible foam is also expected to be minimal. TCPP is harmful to aquatic organisms.

Human Health

TCPP has low volatility at ambient temperature and pressure and is produced in a closed system, therefore, exposure to workers is expected to be minimal. In addition, exposure to the workers during the processing of the chemical as a flame retardant in rigid and flexible foam is also expected to be minimal.

TCPP shows low acute toxicity following oral, dermal or inhalation exposures. It is a slight skin and eye irritant and is not genetically active. Repeated dose studies showed no adverse effects, it is neither neurotoxic nor teratogenic.

FULL SIDS SUMMARY

Tris(1-chloro-2-propyl)phosphate

(CAS NO. 13674-84-5)		SPECIES	PROTOCOL	RESULTS
PHYSICAL-CHEMICAL				
2.1	Melting Point or Decomposition Point		OECD	Pour Point: -51°C Decomposes at 244°C
2.2	Boiling Point			Not applicable
2.3	Vapor Pressure		ASTM D2879	40 mmHg at 110°C < 2 mmHg at 25°C
2.4	Partition Coefficient		EC Guideline 92/69 Annex 5, Method A8	Log Pow = 3.33 at 20°C Log Pow = 2.59
2.5	Water Solubility			0.11% at 25°C
2.6	Flashpoint		Closed cup ASTM D93 Open cup ASTM D92	Closed cup 185_C Open cup 218°C
2.7	Flammability			Not applicable
2.8	pH in Water			Not applicable
2.9	Other Data			Specific gravity: 1.290 at 25°C Viscosity: 57 cp at 25 °C
ENVIRONMENTAL FATE AND PATHWAYS				
4.1	Degradability (Biotic and Abiotic)			
4.1.1	Biodegradability		OECD 301E OECD 301C, MITI test (equivalent)	14% after 28 days 0% after 28 days
4.1.2	Sewage Treatment			No data
4.1.3	Stability			No data
4.1.4	Identification of main mode of degrability in actual use			No data
4.2	Bioaccumulation			No data
4.3	Transport/dist. between Environmental compartments			No data
4.4	Monitoring Data			No data
ECOTOXICOLOGICAL DATA				
5.1	Toxicity to Fish			
5.1.1	Acute Tests	Fathead minnow		LC50 = 51 mg/l; 96 hrs. (actual conc.) NOEC = 9.8 mg/l; 96 hrs.
5.1.2		Bluegill sunfish		LC50 = 180 mg/l; 96 hrs. (nominal conc.) NOEC = 9.8 mg/l; 96 hrs.
5.1.3	Results of long term tests (e.g., prolonged toxicity) early life stage			No data
5.2	Toxicity to Daphnids			
5.2.1	Acute Tests	Daphnia magna		LC50 = 131 mg/l; 96 hrs. (actual conc.)
5.2.2	Results of Longer-term tests (e.g., reproduction)	Daphnia magna		21 day study; NOEC = 32 mg/l
5.3	Toxicity to Algae	Selenastrum capricornum	OECD 201	ErC50 = 73 mg/l; 96 hrs. EbC50 = 47 mg/l; 96 hrs.

				NOEC = 6 mg/l; 96 hrs. LOEC = 18 mg/l; 96 hrs.
5.4	Toxicity to Other Aquatic Organisms			No data
5.5	Toxicity to Bacteria			No data
5.6	Toxicity to Terrestrial Organisms			No data
5.7	Biological Effects Monitoring (including Biomagnification)			No data
5.8	Biotransformation and Kinetics in Environmental Species			No data
TOXICOLOGICAL DATA				
6.1	Acute Toxicity			
6.1.1	Acute Oral	Rat		LD50 (range) = 1017-4200 mg/kg (male) 1969 mg/kg (female)
6.1.2	Acute Inhalation	Rat		LC50 > 4.6 mg/l (4 hr. exp.)
6.1.3	Acute Dermal	Rabbit		LD50 > 2000 m g/kg (24 hr. exp.)
6.2	Corrosive/Irritation			
6.2.1	Dermal Irritation	Rabbit		Slight skin irritant following 24 hr. exp.
6.2.2	Eye Irritation	Rabbit		Slight eye irritant
6.3	Skin Sensitization			No data
6.4	Repeat Dose			90 day dietary study; NOAEL (male rats) = 800 ppm NOAEL (female rats) = 7500 ppm
6.5	Genetic Toxicity			In vitro and in vivo genetic assays conducted; not genetically active. See dossier and SIAR comments.
6.5.1	Bacterial Test			See above
6.6	Carcinogenicity			No data
6.7	Reproductive and Developmental Toxicity			
6.7.1	Reproductive Toxicity single generation reproductive toxicity study with teratology screen			No data
6.7.2	Teratogenicity/Develop-mental Toxicity	Rat		Dietary study; NOEL = 1000 mg/kg/day (maternal tox. and develop. tox.)
6.8	Specific Toxicities			
6.8.1	Neurotoxicity	Hens		No evidence of delayed neurotoxicity
6.9	Toxicokinetics	Rat		Elimination = 89% (72 hrs.) Total body burden = <1% (8 days)
7.0	Experience with Human Exposure			Consumer: not anticipated Occupational: not anticipated (produced in completely closed system; low volatility)
7.1	Biological Monitoring			No data

OECD HIGH PRODUCTION VOLUME CHEMICALS PROGRAMME
PHASE 3

SIDS INITIAL ASSESSMENT REPORT
Tris (1-chloro-2-propyl) phosphate
CAS NO. 13674-84-5

1. IDENTITY

Tris (1-chloro-2-propyl) phosphate **CAS NO. 13674-84-5**

Tris (1-chloro-2-propyl) phosphate (TCPP) is a clear colorless liquid which is stable at ambient temperature and is not volatile. It is manufactured to a purity of 75 ± 10%. Major impurities are bis (1-chloro-2-propyl)-2-chloropropyl phosphate (20-30%) and bis (2-chloropropyl)-1-chloro-2-propyl phosphate (3-5%). Both Fyrol PCF and Antiblaze 80 (trade names) have a similar composition/purity.

2. EXPOSURE

2.1 General Discussion

Production levels are greater than 15,000 metric tons per year.

TCPP can be manufactured by either a batch or continuous process. TCPP is the reaction of phosphorous oxytrichloride with propylene oxide in the presence of a catalyst. The reaction is carried out in a closed reactor. The crude product is washed and dehydrated in a closed vessel to remove acidic impurities and residual catalyst. All transfers are done using closed lines. The product is then filtered, transferred, and packaged using sealed pumps through closed lines. Storage is in closed vessels under nitrogen to exclude moisture and oxygen.

TCPP use is as a flame retardant in rigid and flexible polyurethane foam. The known use is industrial.

TCPP has a log Pow of 2.59 which would indicate a low potential for bioaccumulation in aquatic organisms.

2.2 Environmental Exposure

No specific information on environmental levels of TCPP is included in the SIDS.

2.2.1 Production Releases

No specific information on releases from production is included in the SIDS. However, all emissions which may occur during the manufacturing process are controlled via a tail gas scrubber system.

2.2.2 Release from Use

During the manufacture of foams (rigid or flexible) a closed system is used and all emissions are controlled to prevent occupational exposure to isocyanates. Therefore, any emissions due to other chemicals involved in foam manufacture, such as TCPP, are controlled below statutory airborne standards. Possible release of TCPP during handling is addressed. A PEC (local) is calculated and presented in the SIDS. A PEC/PNEC ratio of 0.17 is derived based on a calculated PEC (local) of 20 mg/l and a PNEC of 120 ug/l.

2.2.3 Widespread release

No information on widespread release is provided in the SIDS. However, since TCPP and foams are manufactured in a closed system and all emissions are controlled widespread release would not be anticipated.

2.3. Consumer Exposure

No information on consumer exposure is provided in the SIDS.

2.4 Occupational Exposure

TCPP is a liquid at ambient temperature. It has low volatility at ambient temperature and pressure and is produced in a closed system. Exposures via the inhalation or dermal route during the production and use of TCPP are not expected to occur. However, the wearing of personal protective equipment, (safety goggles, gloves, protective clothing and a organic vapor acid gas respirator) is recommended.

Oral exposure would not be anticipated to be a significant route of exposure in occupational settings.

3. Toxicity

3.1 Ecotoxicity

The results of the biodegradability and aquatic tests are available in the SIDS. TCPP was not readily biodegradable. Biodegradation was reported as 14% after 28 days. The results of the aquatic testing are presented in the following table:

TABLE 1

SPECIES	END POINT	DURATION	VALUE (mg/l)
FISH			
Pimephales promelas (Fathead Minnow)	LC_{50} NOEC	96 Hrs. 96 Hrs.	51 [a] 9.8
Lepomis macrochirus	LC_{50} NOEC	96 Hrs. 96 Hrs.	180 [b] 9.8

(Bluegill Sunfish)			
INVERTEBRATES			
Daphnia magna	LC_{50} NOEC	96 Hrs. 21 Days	131 [a] 32
ALGAE			
Selenastrum capricornutum	ErC_{50} EbC_{50} NOEC LOEC	96 Hrs. 96 Hrs. 96 Hrs. 96 Hrs.	73 47 6 18

NOTES: a - Actual Concentration b - Nominal Concentration

Based on the data presented in Table 1, TCPP would be considered harmful to aquatic organisms. TCPP is not expected to bioaccumulate based on a log Pow of 2.59.

The lowest NOEC (6 mg/l) is that from the algae study. Based on the EC risk assessment guidance,an assessment factor of 50 is applied resulting in a PNEC of 120 ug/l.

3.2 Health Effects

3.2.1 Single Exposure

TCPP is of moderate to low acute oral toxicity when tested in rats. Oral LD_{50} values ranged from 1017-4200 mg/kg for male and female rats with a combined average of 1969 mg/kg. Acute dermal LD_{50s} are greater than 2000 mg/kg following 24 hour exposures. The results indicate low dermal toxicity with the potential for dermal absorption being low. Acute inhalation toxicity is low following 4 hour exposure to limit concentrations. LC_{50} was found to be greater than 4.6 mg/l.

TCPP was found to be a slight skin irritant following 24 hour exposures and a slight eye irritant.

3.2.2 Repeated Exposure

A 90 day dietary study was conducted in male and female rats with TCPP concentrations ranging from 800 - 20,000 ppm (Approx. 80 - 2000 mg/kg/day). There were no mortalities and no treatment-related clinical signs were noted. Body weight was decreased at the high dose level only in both sexes.

Significantly increased absolute and relative liver weights were found in male rats of all groups and in female rats fed 7,500 or 20,000 ppm. The mean kidney weights of males given 7,500 ppm or greater were significantly increasedrelative to controls, while female rats were unaffected.

Histopathologic and treatment-related change was seen in the livers of rats fed 20,000 ppm. This change was characterized by a very mild swelling of cells located in the periportal region of the hepatic lobule. Very mild cortical tubular degenerative changes were observed in the kidneys of male rats fed diets containing 7500 ppm and in male and female rats administered 20,000 ppm. The sternal bone marrow of three rats administered 20,000 ppm was observed to be very mildly hypoplastic. Very mild thyroid follicular hyperplasia was found in all males and in females given 20,000 ppm.

There were no treatment-related effects observed in hematology; clinical chemistry; and in brain, plasma and erythrocyte cholinesterase activity.

All histopathologic changes were considered reversible. The NOAEL for male rats was 800 ppm and for female rats 7500 ppm.

3.2.3 Reproductive Toxicity

Existing data support the assumption that TCPP does not present a reproductive concern. There were no gross or histopathological changes noted in the reproductive organs of males or females in a 3-month dietary study conducted in rats at dose levels ranging from 800-20,000 ppm. In addition, genetic toxicity data suggest that the chemical is non-genotoxic.

A developmental toxicity study was conducted in rats at dietary concentrations ranging from 0.01 - 1.0% (approximately 10-1000 mg/kg/day). The rats were exposed from days 0 - 20 of gestation.

There was no significant differences between the test and control groups in terms of dam weight gain; food intake; implantation results; resorption and fetal weight. No fetuses with gross malformations were observed in any treated group and there was no fetal mortality.

Litters delivered normally at the end of the gestation period were then observed for a period of four weeks. Growth and post-natal development of these animals did not reveal any effects due to the administration of TCPP to the dams. Therefore, a NOEL for maternal toxicity and developmental effects would be 1000 mg/kg/day.

Based on the results of these two studies and the data suggesting that the chemical is non-genotoxic, TCPP is not expected to be a reproductive or developmental toxin.

3.2.4 Genetic Toxicity

TCPP has been evaluated in a number of in vitro and in vivo genetic assays. It was found not to be genetically active in two bacterial assays using Salmonella (Ames Assay) and Saccaromyces and in several non-bacterial assays including a mouse lymphoma assay, two BALB 3T3 cell transformation assays, and an in vivo rat bone marrow cytogentic assay. Although TCPP was reported to be weakly active in an unscheduled DNA synthesis (UDS) assay, and an increase in transformed cells was noted in a BALB assay, these results were questionable due to a lack of a dose response in both assays, a solubility concern and the high spontaneous transformation background in the negative control in the BALB assay. The only genetic assay, therefore, that produced a positive result was a mouse lymphoma assay that was conducted on Antiblaze 80. Since the majority of the genetic data, both in vitro and in vivo, demonstrates a lack of genetic activity, TCPP is not considered to be genetically active.

3.2.5 Other Concerns for Human Health

Neurotoxicity

TCPP was tested in hens for acute delayed neurotoxicity. Two doses (10ml/kg each) were administered orally to hens 21 days apart. No evidence of delayed neurotoxicity was noted.

Toxicokinetics

^{14}C radiolabelled TCPP was given either intravenously or orally to rats. Elimination was by urine and feces with urinary excretion being identified as the primary route. 89% of the dose was eliminated in 72 hours, this represents an average of both routes. Total body burden at the end of 8 days was less than 1% which suggests very little, if any, bioaccumulation.

4. Initial Assessment

4.1 Environment

TCPP is produced in a closed system and has low volatility. Release to the environment, in particular water, is not expected since the effluent from production is treated mainly at on-site facilities that are designed to handle this waste. Should a release occur it would be expected to be minimal considering the efficiency of the on-site waste treatment plants. In addition, even though TCPP did not biodegrade in the standard assay, its low aquatic toxicity to several different species would suggest that any release would have minimal, if any, impact on the aquatic environment. Also, its Pow value would indicate that it would not have the potential to bioaccumulate.

4.2 Human Health

Consumer

TCPP is expected to be bound up in the foam application therefore consumer exposure is not anticipated..

Occupational

TCPP is produced in a completely closed system and has low volatility; occupational exposure is not expected. In addition, exposure to workers during the processing of TCPP in rigid and flexible foam is expected to be minimal. However, shouldexposure occur from an accidental release, health effects are not anticipated. Acute oral, dermal and inhalation toxicity data have shown this chemical to be only slightly toxic. In addition, a 90 day feeding study reported no significant adverse effects from exposure to TCPP. The chemical is not genetically active and no teratogenic effects have been reported. Neurotoxicity testing in hens showed no evidence of acute delayed neurotoxicity so the hemical is not expected to be neurotoxic. Pharmacokenetic data indicates that the chemical is rapidly eliminated, 89% within 72 hours. Therefore, adverse effects from any accidental exposure would not be expected.

5. Conclusions and Recommendations

5.1 Conclusions

5.1.1 Environment

TCPP is not expected to be released into the environment. If any release should occur, the effects would be minimal since the chemical will not bioaccumulate and is only slightly toxic to aquatic organisms.

5.1.2 Human Health

Consumer

Consumer exposure to the TCPP is not anticipated.

Occupational

Occupational exposure to TCPP is not anticipated since it has low volatility and is produced in a closed system. If accidental exposure should occur, no adverse health effects are anticipated given the low toxicity of this material by all exposure routes.

5.2 Recommendations

5.2.1 Environment

No further testing is necessary due to the low toxicity of this chemical and the low potential for release.

5.2.2 Human Health

No further testing is necessary due to the extensive data that already has been generated showing that the chemical has low toxicity. In addition, since the chemical is produced in a closed system and has low volatility, no human exposure is expected.

PRELIMINARY DATA ASSESSMENT AND IDENTIFICATION OF DATA GAPS FOR TRIS(1-CHLORO-2-PROPYL) PHOSPHATE (FYROL PCF)

2.1 Melting or Decomposition Point

The requirement for melting point determination of TCIP does not apply as it is a liquid, however the pour point and decomposition point have been reported in OECD HPV Form 1. Although OECD methods were not specifically used in the generation of this data, the methods of analysis currently used for determination of pour point and decomposition are scientifically valid. No additional work for melting or decomposition point is proposed as the current data should be sufficient for fulfilling the requirements under SIDS.

2.2 Boiling Point

TCIP was reported to decompose before a boiling point could be measured and has been reported in OECD HPV Form 1. Although OECD methods were not specifically used in the generation of this data, the methods of analysis currently used for determination of boiling point/decomposition temperature are scientifically valid. Therefore, no additional work for boiling point is proposed as the current data should be sufficient for fulfilling the requirements under SIDS.

2.3 Vapor Pressure

The vapor pressure of TCIP has been determined and is reported in OECD HPV Form l. Although OECD methods were not specifically used in the generation of this data, the methods of analysis currently used for determination of vapor pressure are scientifically valid. No additional work for vapor pressure is proposed as the current data should be sufficient for fulfilling the requirements under SIDS.

2.4 Partition coefficient n-octanol/water

The octanol/water partition coefficient was determined for TCPP (TCIP) and is reported on OECD HPV Form 1. Although one of the methods used was not specifically OECD, the other method was according to EC Guidelines. No additional work is proposed since the current data should be sufficient for fulfilling the requirements under SIDS.

2.5 Water Solubility

The water solubility of TCIP has been determined and is reported in OECD HPV Form l. Although OECD methods were not specifically used in the generation of this data, the methods of analysis currently used for determination of water solubility are scientifically valid. No additional work for water solubility is proposed as the current data should be sufficient for fulfilling the requirements under SIDS.

2.6 Flash Point

The flash point of TCIP has been determined and is reported in OECD HPV Form l. Although OECD methods were not specifically used in the generation of this data, the methods of analysis currently used for determination of flash point are scientifically valid.

No additional work for flash point determination is proposed as the current data should be sufficient for fulfilling the requirements under SIDS.

4.0 Environmental Fate and Pathways

4.1.1 Biodegradability

The results of a biodegradability study conducted on TCPP are summarized in OECD HPV Form 1. One of the studies was conducted according to OECD Guidelines and should be sufficient for fulfilling the requirements under SIDS. No further testing is necessary.

6.0 Toxicological Data

6.1 Acute Toxicity. Acute oral, dermal, inhalation studies, as well as skin and/or eye irritation studies were conducted as early as 1970 and as late as the mid 1980's. These studies reflect state-of-the-art experimental designs and are summarized on OECD HPV Form 1. No further testing for acute toxicity is required.

6.4 Repeated Dose Toxicity. A two-week range finder and a 13 week dietary study were conducted. These data are summarized in OECD Form l. In the definitive study, all histopathologic changes were considered reversible. Increased relative and absolute liver weight without concomitant histopathologic change was regarded as a non-adverse effect. Therefore, an 800 and a 7500 ppm NOAEL were reported for male and female rats, respectively. Therefore, no further testing for repeated dose toxicity is required.

6.5 Genetic Toxicity. Fyrol PCF has been evaluated in a number of in vitro and in vivo genetic assays. It was found not to be genetically active in two bacterial assays using Salmonella (Ames Assay) and Saccaromyces and in several non-bacterial assays including a mouse lymphoma assay, two BALB 3T3 cell transformation assays, and an in vivo rat bone marrow cytogenetic assay. Although Fyrol PCF was reported to be weakly active in an unscheduled DNA synthesis (UDS) assay, and an increase in transformed cells was noted in a BALB assay, these results are questionable due to a lack of a dose response in both assays, a solubility concern and the high spontaneous transformation background in the negative control in the BALB assay. The only genetic assay, therefore, that produced a positive result was a mouse lymphoma assay that was conducted on Antiblaze 80. Since the majority of the genetic data, both in vitro and in vivo, demonstrates a lack of genetic activity, Fyrol PCF is not considered to be genetically active. These data are summarized in OECD Form 1. No further testing is required for this data point.

6. 7 Reproductive Toxicity

In a 3-month dietary study conducted in rats, no gross or histopathological changes were noted in the reproductive organs of the males or females. In a developmental toxicity study conducted in rats, no teratogenic effects were observed. Based on the results of these two studies and the data suggesting that the chemical is non-genotoxic, it is not expected to be a reproductive or developmental concern. Therefore, the developmental screening endpoint is fulfilled and no further testing is necessary.

Summary of Responses to the OECD/SIDS Request for Available Data on Tris(1-chloro-2-propyl)phosphate

0. General Information

Name of Sponsor country

United States of America

Contact point (name, address, telephone and telefax)

Mr. Charles Auer
Director
EPA-Existing Chemical Assessment Division
Office of Toxic Substances (TS-778)
401 M Street, S.W.
Washington, D.C. 20460

1. Chemical Identity

1.1 CAS number

13674-84-5

*1.2 Name (give the name supplied by the OECD)

Tris(1-chloro-2-propyl)phosphate
(In Europe, this chemical is known as TCPP)

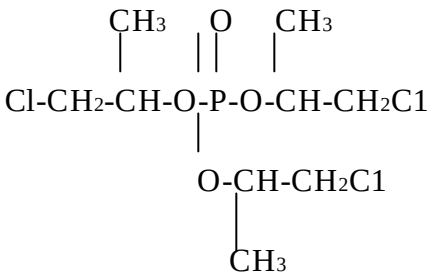
1.3 Common Synonyms

Tri(**b**-chloroisopropyl)phosphate
Tris(1-chloropropyl-2)phosphate
Tri(**b**-chloropropyl)phosphate
TCIP (U.S.)
TCPP (Europe)
Antiblaze 80 (Trade name)
Fyrol PCF (Trade name)

1.4 Empirical formula

$C_9H_{18}C1_3O_4P$

*1.5 Structural formula



1.6 Purity of industrial product

1.6.1 Degree of purity (percentage by weight/volume)

75 ± 10%

1.6.2 Identity of major impurities

20-30%	Bis(1-chloro-2-propyl)-2-chloropropyl phosphate, CAS# Not known
3-5%	Bis(2-chloropropyl)-1-chloro-2-propyl phosphate, CAS# Not known

1.6.3 Essential additives (stabilizing agents, inhibitors, other additives), if applicable

Not applicable

2. Physical-Chemical Data

* 2.1 Melting or Decomposition Point

Pour Point:	51° Centigrade
Decomposition Temperature:	Decomposes at 244°C (700 mmHg)
Method (e.g., OECD, others):	
Pour Point Method:	ASTM D97
Decomposition Temperature Method:	Isoteniscopic ASTM D2897 (Extrapolated initial weight loss by Differential Thermal Analysis is 203°C)
GLP:	YES [ ] NO [X]
Comments:	
Reference:	CF #06191

* 2.2 Boiling Point-Not applicable

Comments:	Boiling point data generation not possible because TCIP decomposes at 244°C, 700 mmHg
Reference:	ARLDF Central File #34977

* 2.3 Vapor pressure

	40 mmHg at 110°C <2 mmHg at 25°C
Method (e.g., OECD, others):	
GLP:	YES [ ] NO [X]
Comments:	
Reference:	Isoteniscopic, ASTM D2879 ARLDF Central File #34977, 064503

* 2.4 Partition coefficient n-octanol/water

log P_{ow}:	3.33
Temperature:	20°C
Method:	EC Guideline 92/69 Annex V, Method A8
GLP:	YES [ ] NO [X]
Comments:	Lack of reproducibility of results which appear to be highly dependent upon volume/ratio of octanol saturated with water.
Reference:	Courtaulds Study, SGS Redwood Limited

log P_{ow}:	2.59
Temperature:	
Method:	
GLP:	Unknown
Comments:	
Reference:	Biodegradation and Bioaccumulation Data on Existing Chemicals based on the CSCL Japan. Compiled under the supervision of Chemical Products Safety Division, Basic Industries Bureau MITI, Ed. by CITI, October 1992. Published by Japan Chemical Industry Ecology-Toxicology and Information Center.

*2.5 Water solubility

	0. 11%
Method (e.g., OECD, others):	
GLP:	YES [ ] NO [X]
Analytical Method:	
Comments:	
Reference:	Albright & Wilson data
	<1% @ 25°C
Method: (e g., OECD, others):	
GLP:	YES [ ] NO [X]
Reference:	ARLDF Centra1 File #06191

*2.6 Flash point (liquids)

	185°C closed cup [X] 218°C open cup [X]
Method	Pensky-Martens Closed Cup ASTM D93 Cleveland Open Cup ASTM D92
GLP:	YES [ ] NO [X]
Comments:	
Reference:	ARLDF Central File 06191

2.7 Flammability (solid/gases)

- Not applicable

2.8 pH in water

- Not applicable

Method (e.g., OECD, others):	
GLP:	YES [ ] NO [X]
Comments:	The solubility of TCIP was reported to be <1% at 25°C, therefore a determination of pH would not be applicable

2.9 Other data e.g., relative density, surface tension (of aqueous solution), fat solubility, explosivity, oxidizing properties and particle size distribution

Comments:	Specific gravity: 1.290 at 25°C/25°C Viscosity: 57 cp at 25°C
Reference:	

3. Source of Exposure

3.1 Production levels expressed as tonnes per annum

2800-3600 Metric tons

3.2 Processes

Potential human and environmental exposure during manufacture is expected to be minimal. The chemical is not considered volatile, and is produced by a batch process in closed systems. Less than 25 workers are expected to be potentially exposed during U.S. manufacture.

Potential human and environmental exposure during the processing of the chemical as a flame retardant in rigid and flexible polyurethane foam is expected to be minimal.

Releases during use are expected to be negligible because of the necessary precautions to prevent exposure to isocyanates. Nevertheless, releases might be possible during handling. According to the "Use Category Document: Plastic Additives" (Building Research Establishment, March 1994), losses during handling of liquid raw materials at room temperature can be estimated at 0.01%. Based on the EU-Technical Guidance Document (draft October 1995), the following default worst acase scenario could be proposed:

Production volume in the EU:	£ 30000 t/a (maximum volume reported in IUCLID)
Inclusion in PU:	10% (BRE, 1994)
Total release rate:	£ 3 t/a (0.01%, see above)
Production duration:	300 d/a (default)
Fraction of main source:	0.05
Daily release rate at the main source:	0.5 kg/d
Flow of receiving waste water treatment plant:	2000 m^3/d (default)
Elmination in a sewage treatment plant:	ca. 20% according to SIMPLETREAT (input parameters: logPow = 3.33; logH < 0, biodegradation rate = 0 hr^{-1})
Dilution factor:	10 (default)
PEC (local)	= 20 mg / l

With a PNEC of 120 mg/l, a PEC/PNEC ratio of 0.17 is derived.

*3. 3 Information concerning uses (including categories and types of uses expressed in percentage terms)

Flame retardant in rigid and flexible polyurethane foam. Only known use is industrial.

3.4 Options for disposal

During manufacture, may be recycled, treated on-site or incinerated, or disposed of in accordance with local and federal regulations.

During processing, may be recycled or disposed of in accordance with local and federal regulations.

3.5 Other remarks

NO DATA PROVIDED

4. Environmental Fate and Pathways

*4.1 Degradability (biotic and abiotic)

4.1.1 Biodegradability

Type:	Aerobic
Inoculum:	Activated sludge
Concentration:	100 mg/1
Test Method:	Test method entitled "Biodegration test of chemical substance by micro-organisms etc.;" Stipulated in the Order prescribing the Items of the Test relating to New Chemical Substances (1984, Order No. 1). Equivalent to OECD 301C, MITI test. Sludge concentration 30 mg/l.
GLP:	Unknown
Degradation:	0% after 28 days
Results:	No degradation under test conditions

Reference:	Biodegradation and Bioaccumulation Data on Existing Chemicals based on the CSCL Japan. Compiled under the supervision of Chemical Products Safety Division, Basic Industries Bureau MITI, Ed. by CITI, October 1992. Published by Japan Chemical Industry Ecology-Toxicology & Information Center.

4.1.2 Biodegradability

Type:	Aerobic
Inoculum:	Activated sludge
Concentration:	20 mg/1
Test Method:	OECD Guideline 301 E
GLP:	YES [X] NO [ ]
Degradation:	14% after 28 days
Comments:	Test substance = TCPP 97.9% pure including all isomers as per 1.1 - 1.4. Not readily biodegradable under the criteria of the test, i.e., <70% Biodegradation.
Reference:	Bayer AG, 1990 unpublished data.

4.1.2 Sewage Treatment

NO DATA PROVIDED

4.1.3 Stability in air (e.g., photodegradability) and in water (e.g., hydrolysis)

NO DATA PROVIDED

4.1.4 Identification of main mode of degradability in actual use

NO DATA PROVIDED

4.2 Bioaccumulation

NO DATA PROVIDED

Comments:	Based on mammal metabolism study (in rat), the chemical is not expected to bioaccumulate.

4.3 Transport and distribution between environmental compartments including estimated environmental concentrations and distribution pathways

NO DATA PROVIDED

4.4 Monitoring data (environment)

NO DATA PROVIDED

5. Ecotoxicological Data

5.1 Toxicity to fish

*5.1.1 Results of acute tests

Test substance:	Antiblaze 80
Test species:	Fathead Minnow (Pimephales promelas)
Test method:	Replicate randomly assigned groups of 10 fish each were exposed to nominal concentrations of 0, 0.9, 4.9, 9.8, 49 and 98 ppm Antiblaze 80 for 168 hours under static conditions. Fish at each test concentration were observed for mortality and/or abnormal behavior every 24 hours following study initiation. The criterion for death was a lack of opercular movement.
GLP	YES [ ] Believed to be GLP compliant NO [ ]
Test results:	The 96-hour computer estimated LC50 was 98 ppm based on nominal dose levels using the binomial probability method and 51 ppm based on actual test concentrations using the binomial probability method. The results indicated a 96-hour no-observable affect level (NOEL) of 9.8 ppm based upon behavioral observations.
Comments:	The difference between the nominal and actual concentrations probably resulted from the limited water solubility of Antiblaze 80, especially at the higher concentrations. Abnormal behaviors observed at nominal concentrations of Antiblaze 80 at 49 and 98 ppm included surfacing, dark discoloration, and loss of equilibrium.
Reference:	Study No. 50593. A Static 96-Hour Acute Toxicity Study of Antiblaze 80 to Fathead Minnows; April, 1985.

*5.1.1.2 Results of acute tests

Test substance:	Antiblaze 80
Test species:	Bluegill Sunfish (Lepomis macrochirus)
Test method:	Replicate randomly assigned group of 10 fish each were exposed to nominal concentrations of 0, 0.9, 4.9, 9.8, 49 and 98 ppm Antiblaze 80 for 120 hours under static conditions. Fish at each test concentration were observed for mortality and/or abnormal behavior every 24 hours following study initiation. The criterion for death was a lack of opercular movement.
GLP	YES [ ] Believed to be GLP compliant NO [ ]
Test results:	The 96-hour computer estimated LC50 was 180 ppm based on nominal dose levels calculated by linear regression. The results indicated a 96-hour no-observable

	effect level (NOEL) of 9.8 ppm based upon behavioral observations.
Comments:	The difference between the nominal and actual concentrations probably resulted from the limited water solubility of Antiblaze 80, especially at the higher concentrations. Abnormal behaviors observed at nominal concentrations of Antiblaze 80 at 49 and 98 ppm included surfacing, dark discoloration, and loss of equilibrium.
Reference:	Study No. 50592. A Static 96-Hour Acute Toxicity Study of Antiblaze 80 to Bluegill Sunfish; April, 1985.

*5.1.2 Results of long-term tests, e.g., prolonged toxicity, early life-stage

NO DATA PROVIDED

5.2 Toxicity to daphnids

5.2.1 Results of acute tests

Test substance:	Antiblaze 80
Test species:	Daphnia magna
Test method:	Triplicate randomly assigned groups of 10 first-instar daphnids each were exposed to nominal concentrations of 0, 33.5, 67, 335, 502, and 670 ppm Antiblaze 80 for 48 hours under static conditions. Daphnids at each test concentration were observed for immobilization (used as the criterion for lethal adverse effects due to the difficulty of determining death in daphnids) at 24 and 48 hours following study initiation.
GLP	YES [ ] Believed to be GLP compliant NO [ ]
Test results:	The 48-hour computer estimated LC50 was 209 ppm (95% Confidence Limits, 67-335 ppm) based on nominal dose levels using the binomial probability test, and 131 ppm (95% Confidence Limits, 65-176 ppm) based on actual test concentrations using the binomial probability test. The highest nominal concentration which caused no immobility or abnormal behavior (lethargy, movement only in response to prodding) among test daphnids was 33.5 ppm.
Comments:	Based on chemical analysis of water samples collected from the exposure chambers, it appears that the actual concentrations of Antiblaze 80 are substantially lower than the nominal dose levels. The difference between the nominal and actual concentrations probably resulted from the limited water solubility of Antiblaze 80, especially at the higher concentrations. Therefore, the computer-generated 48-hour LC50 of 209 ppm probably underestimates the actual LC50.

Reference:	Study No. 50591. A Static 48-Hour Acute Toxicity Study of Antiblaze 80 to Daphnia magna; June, 1985.

5.2.2 Results of long-term tests

Test substance:	Tris (1-chloro-2-propyl) phosphate
Test Species:	Daphnia magna
Test Method:	Daphnia magna (4 replicates of 10 daphnids per concentration) were exposed to 10, 18, 32, 56 and 100 mg/l of the test material for a period of 21 days. The test solutions were renewed 3 times per week. The number of live and dead adult Daphnia were determined daily. The number of dead and living offspring per parent animal were assessed at each test media renewal. A NOEC (No Observed Effect Concentration) was determined for reproduction and for mortality of the parent animals.
GLP	YES **[ ]** Believed to be GLP compliant; test conducted according to OECD NO **[ ]** Guideline 202.
Test Results:	At concentrations of 32 mg/ml and lower all parent daphnids survived. At the next higher concentration, 56 mg/ml, all parent animals died within 12 days. NOEC mortality of parent animals therefore is 32 mg/ml. At concentrations of 32 mg/ml and lower there were no effects on reproduction, when compared to the control group. The NOEC for reproduction therefore was 32 mg/ml. Analysis of the test solutions showed that the measured test concentrations were in the range of 85-102% of nominal. The NOEC values are therefore expressed as nominal concentrations.
Comments:	The test material did not show an effect on reproduction of Daphnia magna.
Reference:	SafePharm Laboratories Ltd., United Kingdom, August 1995.

5.3 Toxicity to algae

Test substance:	Fyrol PCF
Test species:	Selenastrum capricornutum
Test method (e.g., OECD, others):	OECD
GLP	YES [X] NO [ ]
Test results:	In the range-finding test, growth of the algae was inhibited at a nominal test concentration of 100 mg/l. On the basis of the results of the range-finding tests, the definitive test has been carried out at the following nominal concentrations of 2, 6, 18, 54 and 162 mg/1. The E_rC_{50} (growth rate) and E_bC_{50} (total growth) (0-96 hour) of Fyrol PCF for Selenastrum capricornitum are 73 mg/1

(57-97 95% confidence limits) and 47 mg/1 (41- 55 (95% confidence limits), respectively.

Maximum concentration at which no effect was observed within the period of the test:

NOEC = 6 mg/1

PNEC = 120 mg/l (result following application of an assessment factor of 50 to NOEC)

Minimum concentration at which effect was observed within the period of the test:

LOEC = 18 mg/1

Comments: The test is valid as shown by the EC_{50} and E_bC_{50} of the reference compound potassium dichromate (0.96 and 0.77 mg/1, respectively), the increase of the extinction of the control over 72 hours by a factor of 116 and a deviation of the pH of no more than 1.5 unit.

Reference: Report Number CRL F92015; Algal Growth Inhibition Test with Fyrol PCF; March, 1992

5.4 Toxicity to other aquatic organisms

NO DATA PROVIDED

5.5 Toxicity to bacteria

NO DATA PROVIDED

5.6 Toxicity to terrestrial organisms

NO DATA PROVIDED

5.6.1 Toxicity to soil dwelling organisms

NO DATA PROVIDED

5.6.2 Toxicity to plants

NO DATA PROVIDED

5. 6. 3 Toxicity to birds

NO DATA PROVIDED

5.7 Biological Effects Monitoring (including biomagnification)

NO DATA PROVIDED

5.8 Biotransformation and kinetics in environmental species

NO DATA PROVIDED

6. Toxicological Data

6.1 Acute toxicity

6.1.1.1 Acute oral toxicity

Test substance:	Fyrol PCF
Test species/strain:	Sprague-Dawley Rats
Test method:	Acute oral toxicity in the rat: Code of Federal Regulations for evaluating highly toxic substances, Part 191.1, Chapt. I, Title 21. (current for 1972)
GLP	YES [ ] NO [X]
Test results:	The oral LD50 was 2700 mg/kg (2,000 - 3690 mg/kg) in male rats. Adverse clinical signs included depression, tremor at dosages greater than 1000 mg/kg.
LD50:	2700 mg/kg (2,000 - 3690 mg/kg) in male rats
Discriminating Dose:	Not Applicable
Comments:	
Reference:	Stauffer Report No. T-4030. Acute toxicity of Fyrol PCF; August 1972.

6.1.1.2 Acute oral toxicity

Test substance:	Fyrol PCF
Test species/strain:	Sprague-Dawley Rats
Test method:	Acute oral toxicity in the rat: Code of Federal Regulations for evaluating highly toxic substances, Part 191.1, Chapt. I, Title 21. (current for 1970)
GLP	YES [ ] NO [X]
Test results:	The oral LD50 was 2000 mg/kg (1,230-3,240 mg/kg) in male rats and 1,260 (926-1710 mg/kg) in female rats. Adverse clinical signs at 464 mg/kg included depression and intermittent muscle spasms. Higher dose levels induced spasms, salivation, ataxia and spasmodic jumping.
LD50:	2000 mg/kg (1,230-3,240 mg/kg) in male rats 1,260 (926-1710 mg/kg) in female rats

Discriminating dose (for fixed dose only): Not Applicable

Comments:	
Reference:	Stauffer Report No. T-1453. Acute toxicity of Fyrol PCF; February 1970.

6.1.1.3 Acute oral toxicity

Test substance:	Fyrol PCF (Lot 4800-3-10)
Test species/strain:	Charles River Sprague-Dawley Rats
Test method:	USEPA "Proposed Guidelines for Registering Pesticides in the US; Hazards
Evaluation:	Humans and Domestic Animals." *Fed. Reg.* 43:163, 37336-37402 (1978). (LC50 with 14-day observation)

GLP	YES [ ] NO [X]
Test results:	The oral LD50 was 4200 mg/kg in male rats and 2800 mg/kg in female rats. Adverse clinical signs included depression, tremors, lacrimation, salivation, convulsions (females only) and hyperactivity (females only) .
LD50:	4200 mg/kg in male rats 2800 mg/kg in female rats

Discriminating dose (for fixed dose only): Not Applicable
Comments:
Reference: Stauffer Report No. T-6556. Acute toxicity of Fyrol PCF Lot No. (4800-3-10); April 18, 1979.

6.1.1.4 Acute oral toxicity

Test substance:	Tris(2-chloropropyl) phosphate
Test species/strain:	Sprague-Dawley Rats
Test method:	Graded doses of the test article ranging from 320 mg/kg to 5000 mg/kg was administered intragastrically to groups of 5 male and/or 5 female fasted Sprague-Dawley rats. Mortality and clinical signs were recorded for a period of 14 days post-treatment. LD50 values were calculated using the method of Litchfield and Wilcoxin.
GLP	YES [ ] Unknown NO [ ]
Test results:	The oral LD50 was 1546 mg/kg (95% Confidence Limits, 1066-2241 mg/kg) for males and 1017 mg/kg (95% Confidence Limits, 727-1423 mg/kg) for females. Clinical signs observed among survivors included increased or decreased activity, oral, nasal, perianal and ocular discharge, hunching, rough coat, aggression, diarrhea, dehydration, decreased body temperature, alopecia, emaciation, decreased excreta, anorexia, and sporadic twisting and teeth chattering.
LD50:	1546 mq/kg (95% Confidence Limits, 1066-2241 mg/kg) for males and 1017 mg/kg (95% Confidence Limits, 727-1423 mg/kg) for females

Discriminating dose (for fixed dose only): Not Applicable
Comments:
Reference: Study No. 461-80. Oral LD50 of Tris (2-chloropropyl) Phosphate, Lot PP-2B in Sprague-Dawley Rats After a Single Administration; September, 1980.

6. 1. 1. 5 Acute oral toxicity

Test substance:	Antiblaze 80
Test species/strain:	Sprague-Dawley Rats
Test method:	Graded doses of the test article ranging from 700 mg/kg to 5000 mg/kg was administered intragastrically to groups of 5 male and/or 5 female Sprague-Dawley rats.

	Mortality and clinical signs were recorded for a period of 14 days post-treatment.
GLP	YES [ ] Believed to he GLP compliant. NO [ ]
Test results:	The oral LD50 was calculated as 1824 mg/kg (95% Confidence Limits, 1174-2834 mg/kg) for males, and 1101 mg/kg (95% Confidence Limits, 1038-1981 mg/kg) for males and females combined. Clinical signs observed included decreased activity, oral/nasal discharge, convulsions, emaciation and prostration.
LD50:	1824 mg/kg (95% confidence Limits, 1174-2834 mg/kg) for males, and 1101 mg/kg (95% Confidence Limits, 1038-1981 mg/kg) for males and females combined
Discriminating dose	Not Applicable
Comments:	
Reference:	Study No. 2427-80 The Acute Oral Toxicity of Tris (2-Chloropropyl) Phosphate "Antiblaze 80" in Albino Rats; 1981.

6.1.2.1 Acute inhalation toxicity

Test substance:	Fyrol PCF (lot No. 4800-3-10; 98% pure)
Test species/strain:	Charles River Sprague-Dawley
Test method :	USEPA "Proposed Guidelines for Registering Pesticides in the US; Hazards Evaluation: Humans and Domestic Animals." *Fed. Reg.* 43:163, 37336-37402 (1978). (limit study)
GLP	YES [X] NO [ ]
Test results:	The 4-hour whole body LC50 was greater than the limit concentration tested, 4.6 mg/l. Test material was generated as an aerosol.
LC50:	>4.6 mg/1
Comments:	
Reference:	Stauffer Report No. T-6556. Acute Inhalation Toxicity of Fyrol PCF in Albino Rats; January 1979.

6.1.2.2 Acute inhalation toxicity

Test substance:	Tris(2-chloropropyl) phosphate
Test species/strain:	Sprague-Dawley Rats
Test method:	5 male and 5 female rats were exposed to a nominal concentration of 17.8 mg/1 as an aerosol via whole body inhalation for 1 hour. Mortality clinical signs were recorded for 14 days post-treatment.
GLP	YES [ ] Unknown NO [ ]
Test results:	No test animals died during this study. Decreased activity, partially closed eyes, swollen eyelids and lacrimation was observed in all test animals, and

	excessive salivation was observed in some rats during exposure. Most test animals exhibited dry rales during the first 4 days post exposure. 9/10 rats had oily and/or matted fur upon removal from the chamber which persisted through day 10 post exposure.
LC50:	>17.8 mg/1
Comments:	
Reference:	Study 465-80. An Acute Inhalation Toxicity Study of Tris(2-Chloropropyl) Phosphate; December, 1980.

6.1.2.3 Acute inhalation toxicity

Test substance:	Antiblaze 80
Test species/strain:	Sprague-Dawley Rats
Test method:	5 male and 5 female rats were exposed to 5.05 mg/1 as an aerosol via whole body inhalation for 4 hours. Mortality clinical signs were recorded for 14 days post-treatment.
GLP	YES [X] NO [ ]
Test results:	0/5 males and 3/5 females died following a 4 hour exposure to 5.05 mg/1. Clinical signs of watery salivation, decreased activity half to completely closed eyes and coats wetted with the test material were observed during exposure. Clinical signs subsequent to exposure included slight to severe lethargy, reddish lacrimation, acute body weight depression, brownish oral discharge, slight alopecia, convulsions and dyspnea. All observed effects had disappeared in all surviving rats by 14 days post-treatment.
LC50:	>5 mg/1 males; >5 mg/1 females
Comments:	The actual test concentration was determined by gravimetric analysis.
Reference:	Study 2425-80. Four Hour Acute Inhalation Toxicity Study in Sprague-Dawley Rats with 2425-80; September, 1981.

6.1.3.1 Acute dermal toxicity

Test substance:	Fyrol PCF
Test species/strain:	New Zealand White Rabbits
Test method:	Acute dermal toxicity in the rabbit: Code of Federal Regulations for evaluating highly toxic substances, Part 191.1, Chapt I, Title 21. (limit test; current for 1970)
GLP	YES [ ] NO [X]
Test results:	The dermal LD50 was <5000 mg/kg (1,230-3,240 mg/kg) in male rats and 1,260 (926-1710 mg/kg) in

female rabbits. No adverse clinical signs and no local irritation were observed.

LD50: <5000 mg/kg (1,230-3,240 mg/kg) in male rats and 1,260 (926-1710 mg/kg) in female rabbits

Discriminating dose (for fixed dose only): Not applicable

Comments:

Reference: Stauffer Report No. T-1453. Acute toxicity of Fyrol PCF; February 1970.

6. l. 3. 2 Acute dermal toxicity

Test substance: Fyrol PCF (Lot No 4800-3-10)

Test species/strain: New Zealand Albino Rabbits

Test method: USEPA "Proposed Guidelines for Registering Pesticides in the US; Hazards Evaluation: Humans and Domestic Animals." *Fed. Reg.* 43:163, 37336-37402 (1978). (LD50 with a 14 day observation period)

GLP YES [ ]
NO [X]

Test results: The acute dermal LD50 for a mixed population of albino rabbits was >5000 mg/kg. Mild erythema was the only local effect.

LD50: >5000 mg/kg

Comments:

Reference: Stauffer Report No. T-6556. Acute toxicity of Fyrol PCF Lot No. (4800-3-10); April 18, 1979.

6. l. 3. 3 Acute dermal toxicity

Test substance: Tris (2-chloropropyl) Phosphate

Test species/strain: New Zealand White Rabbits

Test method: The test article was administered dermally to 3 male and 3 female New Zealand White rabbits for 24 hours. The application sites on 2 males and 1 female were abraded through the epidermis, while the applications sites on the remaining animals were left intact. Mortality and clinical signs were recorded for 14 days post-treatment. The application sites were assessed for irritancy at 24 and 72 hours post-treatment.

GLP YES [ ] Unknown
NO [ ]

Test: results: No animals died (0/6 deaths). All rabbits showed some erythema and edema formation at 24 hours post-treatment, but returned to normal by 72 hours post-treatment.

LD50: >2 g/kg

Discriminating dose (for fixed dose only): Not applicable

Comments:

Reference: Study No. 462-80. Dermal Toxicity of Tris(2-chloropropyl) Phosphate, Lot PP-2B, in Albino Rabbits After a Single Exposure; September, 1980.

6.1.3.4 Acute dermal toxicity

Test substance: Antiblaze 80
Test species/strain: New Zealand White Rabbits
Test method: The test article was administered dermally to 3 male and 3 female New Zealand White rabbits for 24 hours. The application sites on 2 males and 1 female were abraded through the epidermis, while the applications sites on the remaining animals were left intact. Mortality and clinical signs were recorded for 14 days post-treatment. The application sites were assessed for irritancy at 24 and 72 hours post-treatment.
GLP YES [ ] Believed to be GLP compliant.
NO [ ]
Test results: No animals died (0/6. deaths). All rabbits were clinically normal by Day 2 post-treatment. Transient clinical signs of decreased activity and/or decreased food intake were noted in 4/6 animals.
LD50: >2 g/kg
Discriminating dose (for fixed dose only): Not Applicable
Comments:
Reference: Study No. 2462-80. Acute Dermal Toxicity of Tris(2-chloropropyl) Phosphate, "Antiblaze 80" in Albino Rabbits; March, 1981.

6. 2 Corrosiveness/Irritation

6.2.1.1 Skin Irritation

Test substance: Fyrol PCF
Test species/strain: New Zealand White Rabbits
Test method: Skin irritation in the rabbit: Code of Federal Regulations for evaluating highly toxic substances, Part 191.1, Chapt I, Title 21. (current for 1972)
GLP YES [ ]
NO [X]
Test results: No irritation was observed. The skin irritation index was 0.
Comments:
Reference: Stouffer Report No. T-4030. Acute toxicity of Fyrol PCF; August 1972.

6.2.1.2 Skin Irritation

Test substance: Fyrol PCF (Lot No. 4800-3-10)
Test species/strain: New Zealand Albino Rabbits

Test method:	USEPA "Proposed Guidelines for Registering Pesticides in the US; Hazards Evaluation: Humans and Domestic Animals." *Fed. Reg.* 43:163, 37336-37402 (1978).
GLP	YES [ ] NO [X]
Test results:	Fyrol PCF was deemed a mild irritant after a 24-hour exposure to intact and abraded rabbit skin. The primary irritant score was 0.42 with individual scores ranging from 0.33 to 0.67. Maximum individual erythema scores of 1 were reported at the 24, 48 and 72 hr observation period(s) for some animals.
Comments:	
Reference:	Stauffer Report No. T-6556. Acute toxicity of Fyrol PCF Lot No. (4800-3-10); April 18, 1979.

6.2.1.3 Skin Irritation

Test substance:	Tris (2-chloropropyl) Phosphate
Test species/strain:	New Zealand White Rabbits
Test method:	0.5 ml of the test article was applied to each of two applications sites, one abraded through the epidermis and one intact, on the clipped backs of 3 male and 3 female New Zealand White rabbits, and left in place for 24 hours. All sites were evaluated for skin irritation at 24 and 72 hours post-application, using the technique of Draize.
GLP	YES [ ] Unknown NO [ ]
Test results:	The Primary Irritation Index was 0.5/8.0. Abrasion of the epidermis produced no increase in the degree of irritancy. Combined scores for both abraded and intact sites decreased from 24 hours (0.9/8.0) to 72 hour (0.0/8.0).
Comments:	According to 16 CFR §1500.3, this material is not a skin irritant.
Reference:	Study No. 464-80. Skin Irritation of Tris (2-chloropropyl) Phosphate, Lot PP-2B, After a Single Application to Albino Rabbits; September, 1980.

6.2.l.4 Skin Irritation

Test substance:	Antiblaze 80
Test species/strain:	New Zealand White Rabbits
Test method:	0. 5 ml of the test article was applied to each of two applications sites, one abraded through the epidermis and one intact, on the clipped backs of 3 male and 3 female New Zealand White rabbits, and left in place for 24 hours. All sites were evaluated for skin irritation at 24 and 72 hours post-application, using the technique of Draize.

GLP	YES [ ] Believed to be GLP compliant NO [ ]
Test results:	The Primary Irritation Index was 1.0/8.0. Abrasion of the epidermis resulted in a slight increase in the degree of irritancy (from 0.8/8.0 to 1.1/8.0). Combined scores for both abraded and intact sites decreased from 24 hours (1.3/8.0) to 72 hours (0.6/8.0).
Comments:	According to 16 CFR §1500.3, this material is not a skin irritant.
Reference:	Study No. 2424-80. Primary Skin Irritation of Tris (2-chloropropyl) Phosphate, "Antiblaze 80" After a Single Application to Albino Rabbits; March, 1981.

6.2.2.1 Eye Irritation

Test substance:	Fyrol PCF
Test species/strain:	New Zealand White Rabbits
Test method:	Primary eye irritation in the rabbit: Code of Federal Regulations for evaluating highly toxic substances, Part 191.1, Chapt. I, Title 21. (current for 1970)
GLP	YES [ ] NO [X]
Test results:	No eye irritation was observed at any observation time point.
Comments:	
Reference:	Stauffer Report No. T-1453. Acute toxicity of Fyrol PCF; February 1970.

6.2.2.2 Eye Irritation

Test substance:	Fyrol PCF
Test species/strain:	New Zealand White Rabbits
Test method:	Primary eye irritation in the rabbit: Code of Federal Regulations for evaluating highly toxic substances, Part 191.1, Chapt. I, Title 21. (current for 1972)
GLP	YES [ ] NO [X]
Test results:	No irritation was observed.
Comments:	
Reference:	Stauffer Report No. T-4030. Acute toxicity of Fyrol PCF; August 1972.

6.2.2.3 Eye Irritation

Test substance:	Fyrol PCF (Lot No.4800-3-10)
Test species/strain:	New Zealand Albino Rabbits
Test method:	US EPA "Proposed Guidelines for Registering Pesticides in the US; Hazards Evaluation: Humans and Domestic Animals." *Fed. Reg.* 43:163, 37336-37402 (1978).
GLP	YES [ ] NO [X]

Test results:	Fyrol PCF was deemed a non-irritant in the eyes of albino rabbits. Irritation scores over a 7-day observation period were zero for all animals.
Comments:	
Reference:	Stauffer Report No. T-6556. Acute toxicity of Fyrol PCF Lot No. (4800-3-10); April 18, 1979.

6.2.2.4 Eye Irritation

Test substance:	Tris (2-chloropropyl) Phosphate
Test species/strain:	New Zealand White Rabbits
Test method:	0.1 ml of the test article was instilled into one eye of each of 3 male and 3 female New Zealand White rabbits. The test eyes remained unwashed and were evaluated for eye irritation 1, 24, 48 and 72 hours post-administration using the technique of Draize.
GLP	YES [ ] Unknown NO [ ]
Test results:	The average scores for all animals at 1, 24, 48 and 72 hours post-administration were 3.0/110, 0. 0/110, 0. 0/110 and 0.0/110, respectively.
Comments:	According to 16 CFR §1500.42, this material is not an eye irritant.
Reference:	Study No. 463-80. Eye Irritation of Tris (2-chloropropyl) Phosphate, Lot PP-2B in Albino Rabbits After a Single Exposure; September, 1980.

6.2.2.5 Eye Irritation

Test substance:	Antiblaze 80
Test species/strain:	New Zealand White Rabbits
Test method:	0.1 ml of the test article was instilled into one eye of each of 6 New Zealand White rabbits The test eyes remained unwashed and were evaluated for eye irritation 1, 24, 48 and 72 hours post-administration using the technique of Draize.
GLP	YES [ ] Believed to be GLP compliant NO [ ]
Test results:	The average scores for all animals at 1, 24, 48 and 72 hours post-administration were 10.4/110, 3.7/110, 2.3/110 and 0.7/110, respectively.
Comments:	According to 16 CFR §1500.42, this material is not an eye irritant.
Reference:	Study No. 2423-80. Primary Eye Irritation of Tris (2-chloropropyl) Phosphate, "Antiblaze 80" in Albino Rabbits, March, 1981.

6.3 Skin sensitization

NO DATA PROVIDED

6.4 Repeated dose toxicity

6.4.1 2-week study

Test substance:	Fyrol PCF (Lot 4800-3-10) tri(B-chloroisopropy1) phosphate; 70 5% 2-chloropropanol phosphate 22 5%
Test species/strain:	Charles River CD rats
Test method:	Fyrol PCF was achninistered to rats (10/sex/group) in dietary concentrations of 0, 4200, 6600, 10600, or 16600 ppm for two weeks. Parameters evaluated included clinical signs, food consumption and body weight, hematology, clinical chemistry, cholinesterase, gross necropsy, selected organ weights and gross necropsy.
GLP	YES [ ] No [X]
Test results:	Evidence of toxicity was considered minimal and consisted of a significant reduction in weight gain and reduced food consumption in male rats at 16,600 ppm at week l. Treatment-related alterations were not found in the results of hematology, clinical chemistry or cholinesterase activity.
Dose or concentration at which no toxic effects were observed:	The NOAEL for male and female rats was deemed to be 10,600 ppm.
Comments:	Increased relative and absolute liver weight without concomitant histopathologic change was regarded as a non-adverse effect in these studies.
Reference:	Stauffer Report No. T-10112; Fyrol PCF: A Two-Week Acute Dietary Range-finding Study in Male and Female Charles River Sprague-Dawley Derived Rats; March 1980.

*6.4.2 13-week study

Test substance:	Fyrol PCF (Lot 4800-3-10) tri(B-chloroisopropyl) phosphate; 70 ± 5% 2-chloropropanol phosphate; 22 ± 5%
Test species/strain:	Charles River CD rats
Test method:	Fyrol PCF was administered to rats (20/sex/qroup) in dietary concentrations of 0, 800, 2500, 7500, or 20,000 ppm for three months. Parameters evaluated included clinical signs, food consumption and body weight, hematology, clinical chemistry, urinalysis, cholinesterase, gross necropsy, selected organ weights and gross and selected tissue histopathology.
GLP	YES [ ] NO [X]

Test results: Male and female rats given 20,000 ppm PCF showed significantly reduced body weight at most intervals. No deaths or other treatment-related clinical signs of toxicity were observed. No effect on food consumption was reported.

Significantly increased absolute and relative liver weights were found in male rats of all groups and in females rats fed 7,500 or 20,000 ppm PCF. The mean kidney weights of males given 7,500 ppm or greater were significantly increased relative to controls, while female rats were unaffected.

Histopathologic and treatment-related change was seen in the livers of rats fed 20,000 ppm PCF. This change was characterized by a very mild swelling of cells located in the periportal region of the hepatic lobule. Very mild cortical tubular degenerative changes were observed in the kidneys of male rats fed diets containing 7500 ppm PCF and in male and female rats administered 20,000 ppm PCF. The sternal bone marrow of three rats administered 20,000 PCF was observed to be very mildly hypoplastic. Very mild thyroid follicular hyperplasia was found in all males and in females given 20,000 ppm PCF.

There were no treatment-related effects observed in hematology, clinical chemistry; or in brain, plasma and erythrocyte cholinesterase activity.

Dose or concentration at which no toxic effects were observed:

All histopathologic changes were considered reversible. While the data might suggest a NOAEL of 800 ppm for male rats, a definitive NOEL could not be established The NOEL for female rats was 2500 ppm; the NOAEL for female rats was 7500 ppm PCF.

Comments: Increased relative and absolute liver weight without concomitant histopathologic change was regarded as a non-adverse effect in these studies.

Reference: Stauffer Report No. T-10118; Fyrol PCF 3-Month Dietary Subchronic study in Rats; April 1981.

*6.5 Genetic toxicity

6.5.1.1 Bacterial test

Test substance: Fyrol PCF (Lot 4520-1-1)

Test species/strain: Salmonella typhimurim TA1535, TA1537, TA1538, TA98, TA100 Saccharomyces cereviseae

Test method: A modified Ames assay tested Fyrol PCF in DMSO at 0.001, 0.01, 0.1, 1.0 and 5.0 ul/plate in both bacterial

(incubated for 48 hr at 37 C and then scored) and yeast (incubated at 30 C/nonactivation and 37 C/activation for 3-5 days and then scored) tester strains. The low dose was below a concentration that induced a toxic effect. Testing was conducted with and without S9 from Arochlor- and phenobarbital-treated rats and mice. Appropriate positive controls were also employed.

GLP: YES [ ] NO [X]

Test results: Fyrol PCF was not mutagenic under these test conditions.

Minimum concentration of test substance at which toxicity to bacteria was observed:
with metabolic activation: 5 ul/plate
without metabolic activation: 5 ul/plate

Concentration of the test compound resulting in precipitation:
Not reported

Genotoxic effects:

	+	?	-
with metabolic activation:	[ ]	[ ]	[X]
without metabolic activation:	[ ]	[ ]	[X]

Comments:

Reference: Stauffer Report No.: T-6361; Mutagenicity Evaluation of Fyrol PCF in the Ames Salmonella/Microsoms Plate Test; May 1978.

6.5.1.2 Bacterial test

Test substance: Tris (2-chloropropyl) Phosphate

Test species/strain: Salmonella typhimurium TA98, TA100, TA1535, TAl537, TA1538

Test method: 0.1 ml of test article solution (corresponding to final concentrations of 1.0, 0.33, 0.10 and 0.03 ul/plate), 0.5 ml S-9 mix or $NaP0_4$ buffer and 0.1 ml Salmonella broth culture were added in order to sterile capped culture tubes and incubated with shaking for 20 minutes at 37° C. Top agar, NaC1 and L-histidine HC1-d-biotin was then added, and the tubes gently vortexed and overlayed onto plates containing Volgel-Bonner Minimal E medium plus agar and glucose. Plates were covered immediately, incubated inverted at 37° C for 48 hours in the dark and scored for colonies of histidine prototrophs.

GLP: YES [ ] Unknown NO [ ]

Test results: None of the treated S. typhimurium strains incubated with or without induced rat liver S-9 exhibited reversion frequencies which were substantially greater than spontaneous or solvent controls.

Minimum concentration of test substance at which toxicity to bacteria was observed:
with metabolic activation: 0.97 ul per plate (TA100 and TA1537 used as representative strains)

without metabolic activation: 0. 97 ul per plate (TA100 and TA1537 used as representative strains)

Concentration of the test compound resulting in precipitation:
Not indicated

Genotoxic effects:

	+	?	–
with metabolic activation:	[ ]	[ ]	[X]
without metabolic activation:	[ ]	[ ]	[X]

Comments: Tris (2-chloropropyl) phosphate was not mutagenic under these test conditions.

Reference: Study No. 471-80. An Ames Salmonella/Mammalian Microsome Mutagenesis Assay for Determination of Potential Mutagenicity of Tris(2-chloropropyl) Phosphate; September, 1980.

6.5.2.1 Non-bacterial in vitro test

Test substance: Fyrol PCF (Lot 4520-1-1)

Type of cell used: Fisher mouse lymphoma cell line derived from the 15178Y thymidine kinase (TK) cell line

Test method: Fyrol PCF in DMSO was tested in a mouse lymphoma mutation assay at concentrations of 0.08, 0.16, 0.24, 0.32, 0.48 ul/ml. These concentrations were selected based on toxicity observed at concentrations of 0.64 ul/ml and greater. Fyrol PCF was tested with and without metabolic activation, S9 from mouse livers. The nonactivation assay was a modification of that reported by Clive and Spector (1975). Prior to each treatment, cells were cleansed of spontaneous TK-/-, permitting the survival of only those cells that produce TK. The test compound was added to the medium at predetermined concentrations for 4 hr. The mutagenized cells were washed, fed and allowed to express in a growth medium for 3 days. At the end of this period TK-/- mutants were detected by cloning the cells in the selection medium for 10 days. Surviving cell populations were determined by plating diluted aliquots in nonselective growth medium. The activation assay differed from the nonactivation assay in that the reaction mixture was added to the growth medium containing the desired number of cleansed cells, incubated on a rotary shaker, and terminated by washing the cells. The cells were then allowed to express for 3 days and were cloned as indicated above.

GLP: YES [ ]
NO [X]

Test results: Fyrol PCF was not mutagenic and did not induce forward mutation under the conditions of this assay.

Lowest Concentration producing cell toxicity:
with metabolic activation: 0.48 ul/ml

without metabolic activation: 0.32 ul/ml

Genotoxic effects:

	+	?	–
with metabolic activation:	[ ]	[ ]	[X]
without metabolic activation:	[ ]	[ ]	[X]

Reference: Stauffer Report No. T6343A: Mutagenicity Evaluation of Fyrol PCF in the Mouse Lymphoma Forward Mutation Assay; February 1978.

6.5.2.2 Non-bacterial in vitro test

Test substance: Fyrol PCF (Lot 4520-1-1)

Type of cell used: BALB/3T3 cells from T. Kakunaga at NCI

Test method: A modified method of T. Kakunaga (Int. J. Cancer 12, 463-473, 1973) was used to evaluate the effects of Fyrol PCF in DMSO on the induction morphologic transformation of BALB/3T3 in vitro. Approximately 10^4 cells were exposed in a flask to control (3-methylcholanthrene or DMSO) or 5 concentrations of test material. Fyrol PCF concentrations, based on results from preliminary cytotoxicity testing, were 0.039, 0.078, 0.156, 0.312, and 0.625 ul/ml. Eight to ten replicates per dose level were prepared. Chemical exposure was for 72 hrs. Flasks were washed and incubated for 3-4 weeks, stained with Giemsa, then scored.

GLP: YES [ ]
NO [X]

Test results: A non dose-related increase in the induction of malignant transformation of 3T3 cells was observed at all (four) concentrations not demonstrating cytotoxicity, those from 0.039 to 0.312 ul/ml. Foci occurred at equal frequency and at all levels and did not increase with dose. This may indicate a solubility or a kinetics issue.

Lowest Concentration producing cell toxicity:

with metabolic activation: NA
without metabolic activation: 0.625 ul/ml (75% survival)

Genotoxic effects:

	+	?	–
with metabolic activation:	[ ]	[ ]	[ ]
without metabolic activation:	[ ]	[+]	[ ]

Comments:

Reference: Stauffer Report No. T6357A: Mutagenicity Evaluation of Fyrol PCF in the in vitro Transformation of BALB/3T3 Cells Assay; March 1978.

6.5.2.3 Non-bacterial in vitro test

Test substance: Fyrol PCF (Lot 8400-3-10)

Type of cell used: BALB/3T3 cells obtained from T. Kakunaga at NCI

Test method: A modified method of T. Kakunaga (Int. J. Cancer 12, 463-473, 1973) was used to evaluate the effects of Fyrol PCF in DMSO on the induction of morphologic transformation of BALB/3T3 in vitro. Approximately 10^4 cells were exposed in a flask to control (3-methylcholanthrene or DMSO) or 5 concentrations of test material. Concentrations of Fyrol PCF, based on results from preliminary cytotoxicity testing, were 0.00125, 0.0025, 0.005, 0.01 and 0.02 ul/ml. Eight to ten replicates per dose level were prepared. Chemical exposure was for 72 hrs. Flasks were washed and incubated for 3-4 weeks, stained with Giemsa, then scored for fibroblast-like colonies.

GLP: YES [ ]
NO [X]

Test results: Fyrol PCF did not induce morphological transformation of BALB/3T3 cells under the conditions of this assay.

Lowest Concentration producing cell toxicity:
with metabolic activation: NA
without metabolic activation: 0.039 (50% survival)
0.00125 (77% survival)

Genotoxic effects:

	+	?	–
with metabolic activation:	[ ]	[ ]	[ ]
without metabolic activation:	[ ]	[ ]	[X]

Comments:

Reference: Stauffer Report No. T-6359 (Litton Project No. 20992): Evaluation of Fyrol PCF, Lot #8400-3-10 in the In Vitro Transformation of BALB/3T3 Cells Assay; September 1978.

6.5.2.4 Non-bacterial in vitro test

Test substance: Fyrol PCF (Lot 8400-3-10)

Type of cell used: Human diploid WI-38 cells blocked in G_1 phase

Test method: In an initial unscheduled DNA synthesis (UDS) assay, human WI-38 cells blocked in G_1 phase were grown in a medium containing Fyrol PCF in DMSO at concentrations of 0.1, 0.5, 1 or 5 ul/ml. In one series, S9 from Arochlor-pretreated rat livers provided the activation system. N-methyl nitroguanidine was used as the positive control in the activation system, while benzo(a)pyrene was used as the positive control in the nonactivated system.
A second assay was conducted because Fyrol PCF concentrations above 0.1 ul/ml were too toxic. The second assay employed Fyrol in DMSO at concentrations of 5, 10, 50 and 100 nl/ml.

GLP: YES [ ]
NO [X]

Test results: Fyrol PCF was perhaps weakly active at 0.01 ul/ml in activated and nonactivated systems without an associated dose response at higher concentrations.

Lowest Concentration producing cell toxicity:

with metabolic activation: 0.1 ul/ml
without metabolic activation: 0.1 ul/ml

Genotoxic effects:

	+	?	–
with metabolic activation:	[ ]	[-]	[ ]
without metabolic activation:	[ ]	[+]	[ ]

Comments:

Reference: Stauffer Report No. T-6359 (Litton Project No. 20991): Evaluation of Fyrol PCF, Lot #8400-3-10 in the Unscheduled DNA Synthesis in Human WI-38 Cells Assay; September 1978.

6.5.2.5 Non-bacterial in vitro test

Test substance: Fyrol PCF (Lot 4800-3-10)

Type of cell used: BALB/3T3 cells obtained from T. Kakunaga at NCI

Test method: A modified method of T. Kakunaga (Int. J. Cancer 12, 463-473, 1973) was used to evaluate the effects of Fyrol PCF in DMSO on the induction of morphologic transformation of BALB/3T3 in vitro. Approximately 10^4 cells were exposed in a flask to control (3-methylcholanthrene or DMSO) or ten concentrations of test material. Concentrations of Fyrol PCF employed, based on results from preliminary cytotoxicity testing, were 0.00015, 0.00046, 0.00137, 0.00412, 0.01235, 0.03704, 0.11111, 0.33333, 1.00000 or 3.00000 ul/ml. Eight to ten replicates per dose level were prepared. Chemical exposure was for 72 hrs. Flasks were washed and incubated for 3-4 weeks, stained with Giemsa, then scored for fibroblast-like colonies.

GLP: YES [ ]
NO [X]

Test results: Fyrol PCF did not induce morphological transformation of BALB/3T3 cells under the conditions of this assay.

Lowest Concentration producing cell toxicity:

with metabolic activation: NA
without metabolic activation: 0.0013 ul/ml

Genotoxic effects:

	+	?	–
with metabolic activation:	[ ]	[ ]	[ ]
without metabolic activation:	[ ]	[ ]	[X]

Comments:

Reference: Stauffer Report No. T-10182: Fyrol PCF (Lot No. 4800-3-10) Morphologic Transformation of BALB/3T3 Cells; December 1980.

6.5.2.6 Non-bacterial in vitro test

Test substance:	Antiblaze 80
Type of cell used:	Mouse Lymphoma
Test method:	Murine lymphoma mutaganesis assay with and without metabolic activation (Arochlor 1254-induced rat liver S-9), not further specified.
GLP:	YES [ ] Unknown NO [ ]
Test results:	Without metabolic activation, no increase mutagenic frequency was observed at the highest dose showing acceptable growth. In the first activation, evidence of mutagenicity was obtained at the highest dose, but no dose-response was observed. In the second assay, no dose-related toxicity was observed, but a definite mutagenic dose-response was observed at all doses tested. Induced mutation frequency at the highest dose showing acceptable growth was 18 times that of the negative controls.
Lowest Concentration producing cell toxicity:	
	with metabolic activation: Not indicated without metabolic activation: Not indicated
Genotoxic effects:	

	+	?	–
with metabolic activation:	[X]	[ ]	[ ]
without metabolic activation:	[ ]	[ ]	[X]

Comments:	Under the conditions of this test, Antiblaze 80 was not a direct mutagen, although one or more products of metabolic activation exhibited mutagenic activity.
Reference:	Study No. 2422-80. A Murine Lymphoma Mutagenesis Assay, Heterozygous at the Thymidine Kinase Locus for the Determination of the Potential Mutagenicity of Antiblaze 80; June, 1981.

6.5.3 Non-bacterial test in vivo

Test substance:	Fyrol PCF (Lot 4800-3-10)
Test species/strain:	Charles River Sprague-Dawley
Test method:	In this rat bone marrow cytogenetics assay, Fyrol PCF in DMSO was administered in a single oral bolus dose to groups of 24 male rats at dose levels of 0.011, 0.04, and 0.11 ml/kg. Three additional groups of equal size received subcutaneous injections of the above concentrations for 5 consecutive days. At various times after the last dose (6 to 48 hrs), groups of eight rats were sacrificed and chromosome spreads were prepared and examined for aberrations. Two hours prior to kill, animals were injected intraperitoneally with colchicine to stop cell cycling in metaphase. The positive control used was triethylene melamine (TEM), while DMSO was the solvent control.

GLP:	YES [ ] NO [X]
Test results:	The frequency of chromosomal aberrations in Fyrol PCF treated rats were not significantly different from the frequency in the solvent control rats. Therefore, Fyrol PCF was not clastogenic and did not induce chromosomal damage in rats.
Lowest dose producing toxicity:	Dose selection was based on LD50 value of 1.1 ml/kg
Effect on Mitotic Index or P/N Ratio:	Based on a count of at least 500 cells per animal, the mitotic index for Fyrol PCF was approximately equal to that of the negative control
Genotoxic effects:	+ ? - [ ] [ ] [X]
Comments:	
Reference:	Stauffer Report No. T-6539: Mutagenicity evaluation of Fyrol PCF (Lot No. 4800-3-10) in the Rat Bone Marrow Cytogenetic Analysis; October 1978.

6.6 Carcinogenicity

NO DATA PROVIDED

*6.7 Reproductive and Developmental toxicity

6.7.1 Reproductive toxicity

NO DATA PROVIDED

Comments:	In a 3-month dietary study conducted in rats at dose levels ranging from 800-20,000 ppm, no gross or histopathological changes were noted in the reproductive organs of the males or females. In addition, genetic toxicity data suggests that this chemical is non-genotoxic. Therefore it is not expected that it would present a reproductive concern.

6.7.2 Teratogenicity/Developmental toxicity

Test substance:	TCPP (tris(chloropropy1) phosphate)
Test species/strain:	Wistar rats
Test method:	TCPP was administered to female rats in dietary concentrations of 1.0, 0.1 and 0.01% from days 0-20 of gestation. The dams were examined for implantation, fetal sex ratio, fetal deaths, and resorptions. The fetuses were examined for skeletal and visceral abnormalities, gross malformations and weight.
GLP:	Unknown
Test results:	There was no significant difference between the test and control groups in terms of dam weight gain; food intake; implantation results; resorption and fetal weight. No fetuses with gross malformation were observed in any treated group and there was no fetal mortality.

Skeletal and visceral examinations of the fetuses from all groups failed to reveal any significant difference in the frequency of abnormalities from the control group. No teratogenic effects were observed.

Those litters delivered normally at the end of the gestation period were then observed for a period of four weeks. Growth and post-natal development of these animals did not reveal any effects due to the administration of TCPP to the dams.

Reference: Kawasaki H. et al. 1982 24(5):697-702 Entitled "Studies on the toxicity of insecticides and food additives in the pregnant rats (5). Fetal toxicity of tris chloropropyl phosphate (TCPP).

6.8 Specific toxicities (Neurotoxicity, immunotoxicity etc.)

6.8.1 Acute Delayed Neurotoxicity in Hens

Test substance: Fyrol PCF (Lot 4800-3-10)
Test species/strain: Adult white leghorn hens
Test method: US EPA proposed guidelines for acute delayed neurotoxicity FR 43(163): 37362-37363, 1978.
GLP: YES [ ]
NO [X]
Test results: Fyrol PCF did not induce an acute delayed neurotoxicity in the hen.
Comments:
Reference: Stauffer Report T-6556. Acute Delayed Neurotoxicity Study with Fyrol PCF in Adult Hens. October 1979.

6.9 Toxicodynamics, toxicokinetics

Test substance: Fyrol PCF
tris(1-chloro-2propyl)phosphate 70± 5%
bis(1-chloro-2-propyl) - 2-chloropropyl phosphate 22 ± 5%
bis (2-chloropropyl)-1-chloro-2-propyl phosphate 2-3%
tris(2-chloroethyl) phosphate <0.5%

($(C1CH_2C^*HO)_3P=O$ (^{14}C radiolabel indicated by the asterisk)
Test species/strain: Charles River CD rats
Test method: Radiolabeled dosing solutions were prepared by mixing the ^{14}C-radiolabeled tris(1-chloro-2-propyl)phosphate with the non-radiolabeled Fyrol PCF in a vehicle of ethanol, Emulphor and water. Dosing solutions were prepared and analyzed so that rats wou1d receive

approximately 0.5 ml (2ml/kg body weight) containing either 20 or 200 mg tris(1-chloro-2propyl) phosphate/kg body weight and 40 uCi of radiolabeled tris(1- chloro-2propyl) phosphate.

Two study phases were performed. In the recovery phase animals were dosed and urine, feces and expired air were collected at 11 time intervals over 8 days. At least 5 animals per sex received oral doses of 200 mg/kg, while 5 males each received 20 mg/kg by either a single oral or i.v. administration. In the plasma phase animals were dosed and blood samples, urine and feces were collected at 18 predetermined intervals over 8 days. In both phases, at least 5 animals per sex received oral doses of 200 mg/kg, while 5 males each received 20 mg/kg by either a single oral or i.v. administration. Urine, feces, expired air, tissues and serial blood samples were collected and analyzed for total radioactivity. Metabolites of tris (1-chloro-2-propyl)phosphate were isolated, quantitated, and identified in the urine and feces of rats.

GLP: YES [ ]
NO [X]

Test results: Tris (1-chloro-2-propyl) phosphate and its metabolites were rapidly eliminated following a single bolus dose in male and female rats. The terminal (plasma) half-life was 48.7 ± 6.0 hours. No difference was observed between sexes or between doses. A biphasic (plasma) elimination followed first order kinetics. While urinary excretion was identified as the primary route of elimination, the extent of elimination was dependent upon the amount administered and the route of administration. This was also true for fecal elimination.

Urinary and fecal elimination were sex-independent with eighty-nine percent of the dose being eliminated by 72 hours. Total body burden at the end of eight days was less than 1% suggesting insignificant bioaccumulation. Identifiable metabolites accounted for 75-78.5% of urinary and fecal radiocarbon at both doses in both sexes.0,0-[bis(l-chloro-2-propyl)]-0-(2-proprionic acid) phosphate was identified as a major metabolite and accounted for over 50% of the dose in the urine and feces of both sexes at both dose levels.

Comments:

Reference: Stauffer Report T-10851: Fyrol PCF Metabolism/Pharmacokinetic Study in Rats; August 1984

7. Experience with Human Exposure

7.1 Biological Monitoring

NO DATA PROVIDED

8. Recommended Precautions, Classification (use and/or transportation) and Safety Data Sheets.

ATTACHED

9. Availability and reference(s) for existing review(s)

NO DATA PROVIDED

10. Name of responder

Carol Stack
Manager, Tris Chloralkyl Phosphates Panel
Chemical Manufacturers Association
1300 Wilson Boulevard
Arlington, VA 22209
USA
Phone: (703) 741-5607
Fax: (703) 741-6091

EXTRACT FROM IRPTC LEGAL FILES

```
File: 17.01 LEGAL                                                rn : 1301346
     systematic name:2-Propanol, 1-chloro-, phosphate (3:1)
     common name    :tris(2-chloroisopropyl) phosphate
     reported name  :2-PROPANOL,1-CHLORO-,PHOSPHATE(3:1)
     cas no         :13674-84-5          rtecs no       :TC9000000
     area          : USA                 type          : REG
      --------------------------------
     |subject|specification|descriptor|
     |-------+-------------+----------|
     | MANUF |    REQ      |   PRMT   |
     | USE   |    OCC      |   PRMT   |
     | SAFTY |    OCC      |   MXL    |
      --------------------------------
     ; Summary - THE FOLLOWING CHEMICAL IS INCLUDED ON A LIST OF CHEMICALS
     AND MIXTURES FOR WHICH REPORTING IS CURRENTLY REQUIRED UNDER THE TOXIC
     SUBSTANCES CONTROL ACT SECTION 2607A. THIS TOXIC SUBSTANCE IS SUBJECT TO
     PRELIMINARY ASSESSMENT INFORMATION RULES ON PRODUCT ION QUANTITIES,
     USES, EXPOSURES, AND ADVERSE EFFECTS. MANUFACTURERS INCLUDING IMPORTERS
     MUST SUBMIT A REPORT FOR THIS LISTED CHEMICAL MANUFACTURED AT EACH SITE.
     entry date: OCT 1991                          effective date:      1982

     title: PRELIMINARY ASSESSMENT INFORMATION RULES
     original : FEREAC, Federal Register, 47 , , 26998 , 1982
     amendment: CFRUS*, Code of Federal Regulations, 40 , 712 , 30 , 1990

                                    *******


File: 17.01 LEGAL                                                rn : 1345265
     systematic name:2-Propanol, 1-chloro-, phosphate (3:1)
     common name    :tris(2-chloroisopropyl) phosphate
     reported name  :2-PROPANOL,1-CHLORO-,PHOSPHATE(3:1)
     cas no         :13674-84-5          rtecs no       :TC9000000
     area          : USA                 type          : REG
      --------------------------------
     |subject|specification|descriptor|
     |-------+-------------+----------|
     | MONIT |             |   RQR    |
      --------------------------------
     ; Summary - THIS IS A CHEMICAL OR MIXTURE FOR WHICH REPORTING IS
     CURRENTLY REQUIRED UNDER THE TOXIC SUBSTANCE CONTROL ACT HEALTH AND
     SAFETY STUDIES SECTION 2607D. PERSONS WHO CURRENTLY MANUFACTURE OR
     PROCESS CHEMICAL SUBSTANCES OR MIXTURES FOR COMMERCIAL PURPOSES, THOSE
     WHO PROPOSE TO DO SO, AND THOSE WHO ARE NOT CURRENTLY INVOLVED WITH A
     LISTED CHEMICAL BUT WHO MANUFACTURED OR PROCESSED IT OR PROPOSED TO DO
     SO ANY TIME DURING THE TEN YEAR PERIOD PRIOR TO THE TIME IT BECAME
     LISTED MUST SUBMIT TO THE ADMINISTRATOR OF THE U.S. EPA STUDIES OR LISTS
     OF HEALTH AND SAFETY STUDIES CONDUCTED ON THIS SUBSTANCE FOR EVALUATION.
     entry date: OCT 1991                          effective date:      1986

     title: HEALTH AND SAFETY DATA REPORTING RULES SECTION 8(D)
     original : FEREAC, Federal Register, 51 , , 32726 , 1986
     amendment: CFRUS*, Code of Federal Regulations, 40 , 716 , 120 , 1990
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