FOREWORD INTRODUCTION

N-BUTYL ACRYLATE

CAS N°:141-32-2

SIDS Initial Assessment Report

For

SIAM 15

Boston, Massachusetts, October 22-25, 2002

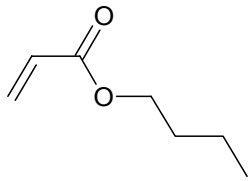
1. Chemical Name:	n-Butyl Acrylate
2. CAS Number:	141-32-2
3. Sponsor Country:	United States
	National SIDS Contact Point in Sponsor Country: Oscar Hernandez Division Director RAD 7403 M 1200 Pennsylvania Avenue, NW Washington DC, 20460 (202) 564-7461 hernandez.oscar@epa.gov
4. Shared Partnership with:	ICCA
5. Roles/Responsibilities of the Partners:	
• Name of industry sponsor /consortium	Industry Contact: Elizabeth Hunt Basic Acrylic Monomer Manufacturers, Inc. 941 Rhonda Place SE Leesburg, VA 20175 phone: 703-669-5688 e-mail: ehunt@adelphia.net
• Process used	
6. Sponsorship History	
• How was the chemical or category brought into the OECD HPV Chemicals Programme ?	Documents were prepared and reviewed by industry prior to submission to sponsor country. Sponsor country conducted reviews of submitted data and offered comments to industry. Industry prepared and resubmitted documents for consideration at SIAM 15. Data searches consisted of searching available literature, databases and internal consortia files.
7. Review Process Prior to the SIAM:	
8. Quality check process:	
9. Date of Submission:	

10. Date of last Update:

11. Comments: Testing: No testing (X)

Testing ( )

SIDS INITIAL ASSESSMENT PROFILE

CAS No.	141-32-2
Chemical Name	n-Butyl Acrylate
Structural Formula	

SUMMARY CONCLUSIONS OF THE SIAR

Category/Analogue Rationale

In some circumstances, available data on iso-butyl acrylate (CAS No. 106-63-8) may be presented to assist in the weight of evidence approach for n-butyl acrylate, based on structural similarities. Since sufficient data exists for n-butyl acrylate for the majority of SIDS endpoints, data on iso-butyl acrylate is only presented for those endpoints in which further supporting data may assist in adding to the characterization of a particular endpoint. This is done primarily for the aquatic toxicity endpoints.

Human Health

After oral administration, n-butyl acrylate is rapidly absorbed and metabolized in male rats (75% was eliminated as CO_2, approximately 10% via urine and 2% via feces). The major portion of n-butyl acrylate was hydrolyzed by carboxyesterase to acrylic acid and butanol.

Following acute exposure, n-butyl acrylate exhibits low toxicity. n-Butyl acrylate has oral LD50s of 3143 mg/kg bw (rats) and 9050 mg/kg bw (male rats), an inhalation LC50 (4-hour, rat) of 10.3 mg/L and a dermal LD50 (rabbit) of 2000 to 3024 mg/kg. n-Butyl acrylate is irritating to skin and eyes and showed a skin sensitizing potential in animals. In humans, skin sensitization to butyl acrylate was reported.

In an oral (drinking water) 90-day study in rats, using a satellite group (gavage) at 150 mg/kg bw/day, the only effects reported were a slight reduction in water consumption in all dose groups and a decrease in weight gain in the highest dose group. The NOAEL (males) = 84 mg/kg/bw/day and NOAEL (females) = 111 mg/kg/bw/day. The NOAEL (gavage) (males and females) = 150 mg/kg/bw/day. In a 90-day inhalation study, rats were exposed to 0, 21, 108, 211, and 546 ppm (0, 0.11, 0.57, 1.12, 2.90 mg/L) n-butyl acrylate. The primary effects at 211 ppm (1.12 mg/L) were irritation of eyes and nasal mucosa, reduced body weights (13.3 percent in males and 3.76 percent in females compared with controls), decreased potassium values (females) and an increase in alkaline phosphatase activity (females.) At the highest dose of 546 ppm (2.90 mg/L) 31 of 40 animals died. The primary cause of death was due to the strong irritation of the substance on the respiratory tract. The NOAEL = 108 ppm (0.57 mg/L/day) and the LOAEL = 211 ppm (1.12 mg/L/day). In a two-year inhalation study, rats (male/female) received whole body exposures of 0, 15, 45, or 135 ppm (0, 0.086, 0.258, 0.773 mg/L). There was a slight decrease in food consumption and slightly lower relative heart, kidney, liver and thyroid weights at the highest dose. A NOAEL was determined to be 45 ppm (0.258 mg/L/day) based upon localized and diffuse stippling of the corneal epithelium, cloudiness of the cornea, and various degrees of vascularization. The severity of nasal mucosa effects increased with dose and occurred at all doses in males and females. Effects ranged from slight atrophy of the neurogenic part of the olfactory epithelium at 15 ppm (0.086 mg/L) to partial loss of the columnar cell layer and stratified reserve-cell hyperplasia at 45 (0.258 mg/L) and 135 ppm (0.773 mg/L).

n-Butyl acrylate was negative in the Ames test with *Salmonella typhimurium* TA98, TA100, TA1535 and TA1537 with and without metabolic activation tested up to 10,000 µg/plate. In a cytogenetic assay with Chinese Hamster Ovary Cells, n-butyl acrylate showed no clastogenic potential in concentrations where no cytotoxicity occurred. Without metabolic activation an increase of aberrant cells was observed at cytotoxic concentrations. No genotoxic effects were found in an *in vitro* micronucleus test and an UDS-test with Svrian hamster fibroblasts. In an *in vivo*

cytogenetic assay, n-butyl acrylate showed no clastogenic effect in rats and hamsters after inhalation exposure.

n-Butyl acrylate was not carcinogenic to rats via inhalation up to 135 ppm (0.773 mg/L/day), the highest dose tested.

No reproductive toxicity studies are available. However, in repeated-dose studies (noted above), no effects were seen in the reproductive organs. In developmental toxicity studies with rats via inhalation, n-butyl acrylate caused fetotoxic effects (resorptions and reduced number of live fetuses at ≥135 ppm) at maternally toxic concentrations. At exposures of 25, 135 and 250 ppm (0.13, 0.72 and 1.33 mg/L/day), the NOAEL (maternal) = 25 ppm (0.13 mg/L/day) based on reduced body weights and irritation to the eyes and nose. The NOAEL (developmental) = 25 ppm (0.13 mg/L/day), based on post-implantation loss and the NOAEL (teratogenicity) = 250 ppm. In a separate study, female rats were given 100, 200 and 300 ppm. A maternal NOAEL could not be determined based on a reduction of absolute body weight gain at all doses; the maternal LOAEL was set at 100 ppm. At 200 and 300 ppm there was a reduction in fetal body weights. Sporadic malformations occurred at 300 ppm and in the control group. The NOAEL (developmental) was 100 ppm and the NOAEL (teratogenicity) was 300 ppm (highest dose tested).

Environment

The water solubility of n-butyl acrylate is 2 g/L (25 °C) and specific gravity is 0.898 g/cm^3 at 20 °C. The measured log Kow is 2.38. The vapor pressure (based on a regression analysis of measured values from several data sources) is 7.27 hPa at 25 °C. The melting point is - 64°C and the boiling point is 148 °C. The chemical is highly flammable and its flashpoint is approximately 36 ^{0}C. n-Butyl acrylate is photodegraded by reaction with hydroxyl radicals in the atmosphere with a half-life of 1.2 days (calculated). The hydrolysis rate of n-butyl acrylate is extremely low. At pH 7, the approximate half-life is calculated to be 1100 days. The Henry's law constant is 4.7 x 10^{-4} atm/m^3/mol, indicating the potential for moderate volatilization from water. Distribution modeling using Mackay Level I indicates that the main target compartment will be air (94%) with smaller amounts partitioning into water (5.73%) soil (0.11%), and sediment (0.11%). Fugacity model Level III gives comparable results; the levels are: 89.4% (air), 8.24% (water), 2.39% (soil) and 0.0963% (sediment). A BCF of 13 was determined, based on a log K_{ow} of 2.38, indicating a low bioaccumulation potential. In a biodegradation assay according to OECD Guideline 301C (modified MITI-Test (I)) n-butyl acrylate was readily biodegradable (61% after 14 days). In another ready biodegradation test conducted according to OECD Guideline 301D, 57.8% of the chemical biodegraded after 28 days. In acute aquatic toxicity studies, n-butyl acrylate was determined to have toxic effects in the concentration range of 2.1 to 8.2 mg/L. A measured fish 96-hr LC50 of 2.1 mg/L was determined in a flow-through test in *Cyprinodon variegates.* A measured aquatic invertebrate 48-hr EC50 of 8.2 mg/L was determined in a flow-through test in *Daphnia magna.* Finally, in algae (*Selenastrum capricornutum*) a growth-rate study using measured concentrations resulted in a 96-hr EC50 of 2.6 mg/L (arithmetic mean). In addition, supporting data from iso-butyl acrylate indicate toxicity values with in the same ranges. For iso-butyl acrylate, the most sensitive species was the freshwater fish *Pimephales promelas* (fathead minnow) with a 96-hour LC50 of 2.09 mg/L (measured). The 48-hour EC50 for *Daphnia magna* is 9.7 mg/L (nominal), and for algae (*Desmodesmus subspicatus)* the 72-hour EC50s were 3.18 mg/L (measured) for biomass and 5.28 mg/L (measured) for growth rate.

Exposure

n-Butyl acrylate is manufactured as a chemical intermediate in a closed system. Its major use is in the production of homo- and co-polymers with other monomers (i.e. acrylic acid and its salts, esters, amides, etc.) to produce emulsion polymers. The three major uses of acrylate esters are: surface coatings, adhesives/sealants and textiles. In 2000, production volumes were 250,000 – 400,000 tonnes for Europe, 581,000 tonnes for the US and 130,000 tonnes for Japan. In 2000, US TRI reporting indicates that the majority of n-butyl acrylate is released to the air compartment (94%, 233,013 pounds) where it is subject to photolysis. However, a small percentage is released to the water compartment (6%, 14,566 pounds). Impact on the environment is expected to be low due to photolysis and biodegraditive properties. Extensive occupational exposure monitoring records are available which indicate that 8 hr TWAs for a variety of operations are below the regulatory/guideline values of 2 ppm (8hr TWA) . However, peak exposures were reported above the 2 ppm value and in some circumstances exceeded the NIOSH REL of 10 ppm (TWA) during sampling, cleaning, change of pump filter, check of detonation arrestors, inhibitor preparation, drumming and waste disposal. Records indicate that personnel performing these tasks wear the appropriate personal protective equipment and therefore, exposures to pesonnel are estimated to be lower depending upon protection factors of the personal protective equipment. End-use consumer products contain only trace levels of acrylic acid and esters (as a result of polymerization). Therefore, consumer exposure to acrylate monomers is likely to be low.

RECOMMENDATION

The chemical is currently of low priority for further work.

RATIONALE FOR THE RECOMMENDATION AND NATURE OF FURTHER WORK RECOMMENDED

The chemical possesses properties indicating a hazard for human health and the environment. Based on data presented by the Sponsor country, exposure to humans and the environment is anticipated to be low, and therefore this chemical is currently a low priority for further work. Countries may desire to investigate any exposure scenarios that were not presented by the Sponsor country.

FULL SIDS SUMMARY TABLE

CAS NO: 141-32-2		SPECIES	PROTOCOL	RESULTS
PHYSICAL-CHEMICAL				
2.1	Melting Point		Measured	-64 °C
2.2	Boiling Point		DIN 51751	148 °C
2.3	Density		DIN 51757	0.898 g/m³ at 20 °C
2.4	Vapour Pressure		Regression calculation	7.27 hPa at 25 °C
2.5	Partition Coefficient (log Kow)		OECD 107	2.38 at 25 °C
2.6	Water Solubility		Measured	2 g/l at 25 °C
2.7	Henry' Law Constant		calculated	46.59 Pa m³ mol-1 (at 25 °C)
2.8	Flammability		-	flammable
2.9	Explosive properties			LEL 1.1 vol% (35 °C), UEL 7.8 vol% (73.4 °C)
2.10	Flash point		DIN 51755	36.5 °C
2.11	Ignition point		-	267 °C
2.11	Stability		-	Polymerises easily on standing, accelerated by heat, light and peroxides, polymerisation inhibitors are added to commercial product
ENVIRONMENTAL FATE AND PATHWAY				
3.1.1	Photodegradation		Calculated (AOP, V 1.87)	$t_{1/2;air}$: 1.2 days
3.1.2	Stability in Water		measured / calculated	$t_{1/2}$ pH 3: 2800 days $t_{1/2}$ pH 7: 1100 days $t_{1/2}$ pH 11: 243 minutes
3.3	Transport and Distribution		calculated (Mackay, Level I)	Air: 94 % Water: 5.73 % Soil: 0.11 % Sediment : 0.11 %
			Calculated (Level III Fugacity Model)	Air: 89.4 % Water: 8.24 % Soil: 2.39 % Sediment: 0.00963 %
	Biodegradation	Activated sludge (domestic) Secondary effluent of a WWTP	OECD 301 C (Modified MITI Test (I)) OECD 301 D (Closed Bottle Test)	61 % after 14 d (readily biodegradable) 57.8 % after 28 days

ECOTOXICOLOGY				
4.1	Acute/Prolonged Toxicity to Fish	*Cyprinodon variegatus*	OECD 203	LC_{50} : 2.1 mg/l/96 h (measured)
		Salmo gairdneri	OECD 203	LC_{50} : 5.2 mg/l/96 h (measured)
		Fish	ECOSAR calculation	LC_{50} : 1.786 mg/l/96 h (calculated)
	**iso-butyl acrylate*	*Pimephales promelas*	OECD 203	LC_{50} : 2..09 mg/l/96 h (measured)
	**iso-butyl acrylate*	Fish	ECOSAR calculation	LC_{50} : 1.838 mg/l/96 h (calculated)
4.2	Acute Toxicity to Aquatic Invertebrates	*Daphnia magna*	OECD 202	EC_{50} : 8.2 mg/l/48 h (measured)
		Daphnid	ECOSAR calculation	EC_{50} : 9.81 mg/l/48 h (calculated)
	**iso-butyl acrylate*	*Daphnia magna*	79/831/EEDC, static, nominal concentrations	EC_{50} (48 hours): 9.7 mg/L
	**iso-butyl acrylate*	*Daphnia magna*	79/831/EEDC, static, nominal concentrations	EC_{50} (48 hours): 19.8 mg/L
	**iso-butyl acrylate*	Daphnid	ECOSAR calculation	EC_{50} : 10.653 mg/l/48 h (calculated)
4.3	Toxicity to Aquatic Plants e.g. Algae	*Selenastrum capricornutum*	OECD 201	EC_{50} : 2.6 mg/l/96 h (arithmetic mean, based on measured values at 0 h and 96 h)
		Algae	ECOSAR calculation	EC_{50} : 1.023 mg/l/96 h (calculated)
	**iso-butyl acrylate*	*Desmodesmus subspicatus*	OECD 201, static, measured	EC_{50} (72 hours): 3.18 mg/L (biomass) EC_{50} (72 hours): 5.28 mg/L (cell growth)
	**iso-butyl acrylate*	Algae	ECOSAR calculation	EC_{50} : 1.107 mg/l/96 h (calculated)
4.4	Toxicity to Bacteria	Activated sludge (industrial)		EC0 > 150 mg/l/3 days
	**iso-butyl acrylate*	Activated sludge	OECD 209	EC50 (30 min): > 1000 mg/L
4.5	Chronic Toxicity to Aquatic Invertebrates			no data
4.5.1	Chronic Toxicity to Fish			no data
4.6.3	Toxicity to Other Non-Mammalian Terrestrial Species (Including Birds)			no data

TOXICOLOGY				
5.1.1	Acute Oral Toxicity	rat		ca. 3143 mg/kg bw
5.1.2	Acute Inhalation Toxicity	rat		10.3 mg/l/4 h
5.1.3	Acute Dermal Toxicity	rabbit		2000 – 3024 mg/kg bw
5.2.1	Skin irritation	rabbit		irritating
5.2.2	Eye irritation	rabbit		highly irritating
5.3	Sensitization	guinea pig guinea pig guinea pig mouse mouse	skin painting test maximization test Freund's complete adjuvant test mouse ear swelling test local lymph node assay	not sensitizing sensitizing sensitizing not sensitizing sensitizing
5.4	Repeated Dose Toxicity	rat rat	90 days, inhalation 90 days, drinking water	NOAEL: 108 ppm (0.57 mg/l/day) LOAEL: 211 ppm (1.12 mg/l/day) NOAEL: 84 mg/kg bw/day (males), 111 mg/kg bw/day (females)
5.5	Genetic Toxicity *In Vitro*			
A.	Bacterial Test (Gene mutation)	S. typhimurium	Ames Test	negative; + / - metabolic activiation
B.	Non-Bacterial *In Vitro* Test (Chromosomal aberrations)	CHO-cells	cytogenetic assay	negative; only at cytotoxic concentrations, an increase of aberrant cells
		SHE-cells	in vitro micronucleus test	negative
		SHE-cells	UDS-test	negative
		SHE-cells	cell transformation assay	negative
5.6	Genetic Toxicity *In Vivo*	rat	cytogenetic assay, inhalation	negative
		hamster	cytogenetic assay, inhalation	negative
5.7	Carcinogenicity	rat	2 years, inhalation	no carcinogenic effects up to 135 ppm (0.773 mg/l/day)

5.8	Toxicity to Reproduction	rat	90 d, inhalation	no effect on reproductive organs
5.9	Developmental Toxicity/ Teratogenicity	rat	inhalation, gd 6-20	NOAEL maternal toxicity: could not be determined NOAEL developmental toxicity: 100 ppm (1.06 mg/l/day) NOAEL teratogenicity: 300 ppm (1.6 mg/l/day)
		rat	inhalation, gd. 6-15	NOAEL maternal toxicity: 25 ppm (0.13 mg/l/day) NOAEL developmental toxicity: 25 ppm (0.13 mg/l/day) NOAEL teratogenicity: 250 ppm (1.33 mg/l/day) , highest dose tested
		mouse	gavage, gd. 6-15	NOAEL maternal toxicity: 100 mg/kg bw /day NOAEL develop. Toxicity: 1000 mg/kg bw/day NOAEL teratogenicity: 2000 mg/kg bw/day
5.11	Experience with Human Exposure			skin sensitization reported; patch test concentration: 0.1 to 1.0 %

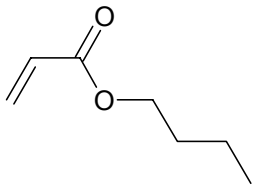
*) Experimental data on iso-butyl acrylate have been included into the assessment, because it is expected that the two structural related chemicals (iso-butyl acrylate and n-butyl acrylate) would exhibit a very similar toxicological behaviour. The assumption is based on evidence from results of acute and in vitro experiments that showed very similar effects associated with the two substances and on the similarity of their physico-chemical properties

SIDS Initial Assessment Report

1 IDENTITY

1.1 Identification of the Substance

CAS Number: n-Butyl Acrylate
IUPAC Name: 141-32-2
Structural Formula:



Synonyms: 2-Propenoic acid, n-butyl ester
Acrylic acid butyl ester
Butyl-2-propenoate
n-Butyl propenoate

1.2 Physico-Chemical properties

Table 1 Summary of physico-chemical properties

Property	Value	Reference
Physical state	Colorless liquid	
Melting point	-64	Ullmann, 2000
Boiling point	148 (DIN 51751)	BASF ,2002b
Relative density (g/cm^3 at 20°C)	0.898	Ullmann, 2000
Vapour pressure (hPa @25°C)	7.27 (regression calculation)	HSDB, 1989 Daubert 1998
Water solubility (at 25 °C)	Soluble in alcohol, ether, most organic solvents 2 g n-butyl acrylate in 1 l H_2O 0.7g H_2O in 100 g butyl acrylate	Ullmann, 2000
Log Kow (at 25 °C)	2.38	
Ignition point	267°C	BASF, 2002b
Purity	Typical commercial samples of n-butyl acrylate have purity of > 99.5% (w/w) and may contain specific impurities: water (≤ 0.05%) and acid (≤ 0.01%, calculated as acrylic acid)	ECETOC, 1994
Explosive properties	LEL 1.1 vol% (35 °C), UEL 7.8 vol% (73.4 °C)	BASF, 2002b
Henry's law constant	46.59 Pa m^3 mol-1 (at 25 °C)	
Flash point (°C)	36.5 (DIN 51755)	BASF, 2002b

Substance Type: Organic Odor: Fruity, Pungent

2 GENERAL INFORMATION ON EXPOSURE

2.1 Production Volumes and Use Pattern

In 2000, n-butyl acrylate was produced in Europe in the range of 250, 000 to 400,000 tonnes at 5 sites. U.S. production in 2000 was 1,292 millions of pounds (approximately 581,000 tonnes) (SRI, 2001). Japanese production in 2000 was approximately 130,000 tonnes.

The sole use of the n-butyl acrylate monomer is as a chemical intermediate in the production of polymeric resins (emulsion polymers) and is handled primarily, if not exclusively, in closed systems. Residual monomer concentrations in the polymers are very low, in consumer products, as higher residual concentrations would lead to customer rejection due to unacceptable odor. Residual n-butyl acrylate monomer is held by Product Specification to <500 ppm n-butyl acrylate. Actual (measured) levels are typically much lower. This very low residual content could not be removed during polymerisation and processing therefore a release out of the final product is not expected and neglectable.

n-Butyl acrylate is used to prepare homopolymers and copolymers with other monomers such as acrylic acid and its salts, amides and esters; methacrylates, acrylonitrile, maleic acid esters, vinyl acetate, vinyl chloride, styrene, butadiene, unsaturated polyesters and drying oils. These polymers and copolymers are used in a variety of products as dispersions or solutions (ECETOC, 1994).

n-Butyl acrylate is used in the production of coatings and inks, adhesives, sealants, textiles, plastics and elastomers. Coating applications include: architectural latex coatings, water-based dispersions, and automotive original equipment manufacture, and refinish materials. Pressure sensitive adhesives contain n-butyl acrylate. Other adhesive applications are found in the textile and construction industries. Textile industry products that contain n-butyl acrylate are fibers, warp sizings, thickener, and back coat formulations (adhesives). In the plastics industry, n-butyl acrylate is found in some PVC modifiers and molding or extrusion additives (BAMM, 1993). In 1999, n-butyl acrylate was the largest volume commodity acrylate ester in Europe (SRI, 2001). In 2000, the U.S. consumption of commodity acrylate esters, from which n-butyl acrylate is the largest volume, was:

End Use	Percent
Surface Coatings	44%
Adhesives / Sealants	18%
Textiles	15%
Plastics Additives	9%
Paper	5%
Others	9%

2.2 Environmental Exposure and Fate

2.2.1 Sources of Environmental Exposure

Under US Toxic Release Inventory (TRI) reporting requirements, in 1999, out of 169 reporting facilities, 141 facilities indicated releases to the environment. In 2000, 137 facilities indicated releases to the environment out of 167 reporting facilities.

TRI Data (in pounds)	Air	%	Water	%	Underground Injection	%	Land	Total Env. Releases
1995	230,275	98.5	2,919	1.25	0	0	559	233,753
1996	215,630	98.7	712	0.33	0	0	2,165	218,507
1997	233,670	96.7	7,242	3	0	0	805	241,717
1998	212,785	96.2	7,790	3.5	0	0	546	221,121
1999	245,012	96.3	8,747	3.4	156	0.27	546	254,461
2000	233,013	94	14,566	6	271	<0.01	245	248,095

2.2.2 Photodegradation

n-Butyl acrylate is indirectly photodegraded by reaction with hydroxyl radicals in the atmosphere with an estimated half-life of approximately 1.2 days (calculated) The degradation reaction occurs via hydrogen abstraction and addition to olefinic bonds leading to a breakdown of the molecule into fragments which are further degradaded and at least will result in H_20 and CO_2. No specific data on possible breakdown products of n-butyl acrylate are available. (BASF AG, 1998a).

2.2.3 Stability in Water

The hydrolysis rate of n-butyl acrylate is extremely slow. The hydrolysis at pH 3 and pH 7 was less than 2% after 28 days (measured) and the hydrolysis half-life was calculated to be 2800 days at pH 3 and 1100 days at pH 7, respectively. The hydrolysis half-life at pH 11 was 243 minutes (Walsh, 1990).

2.2.4 Transport between Environmental Compartments

Distribution modeling using Mackay Level I indicates that n-butyl acrylate is likely to partition to the air compartment (94%) with smaller amounts partitioning into water (5.73%) and negligible amounts remaining in other environmental compartments (soil, sediment) (BASF AG, 1998).

Comparable results were achieved with a Level III fugacity model, using realistic percentages of releases. According to the US-EPA Toxic Release Inventory (TRI) report 1999, releases of n-butyl acrylate were 96.3 % into air 3.4 % into water and 0.27 % into soil. Also, as predicted in Level I fugacity modeling, the Level III fugacity model results indicate that the main distribution will be to the air compartment (89.4%), and smaller amounts will distribute into water (8.24 %), soil (2.39 %) and sediment (0.00963 %) (BASF, 2002c.) It should be noted that at the time modeling was performed, only 1999 TRI values were available, thus they were used in the Level III model instead of 2000 TRI values.

The adsorption and desorption of n-butyl acrylate was examined on five different soils. The soils, an aquatic sandy loam sediment, a loamy sand, a clay loam and 2 loams had a pH range of 5.2 - 7.5. Measured Koc values range from 40-148 with mean being 88 while the estimated Koc value is 94 (BAMM 1991 and BASF 2002c, respectively).

2.2.5 Biodegradation

Aerobic:

In a biodegradation assay, (OECD Guideline 301 C, modified MITI Test (I)), n-butyl acrylate was readily biodegradable: 100 mg test substance/l; sludge concentration: 30 mg/l; 61% biodegradation

after 14 days expressed as BOD (Chemicals Inspection & Testing Institute Japan, 1992). In a Closed Bottle Test (OECD-Guideline 301D) with secondary effluent of a domestic waste water treatment plant a biodegradation of 57.8 % within 28 days was achieved (Wu, 1996)

2.2.6 Bioaccumulation

No experimental data on bioaccumulation is available. However, based on the log P_{ow} of 2.38 and the calculated BCF of 13.1, only a low bioaccumulation potential is expected (BASF AG, 1988, BASF AG, 2002d).

2.3 Human Exposure

2.3.1 Occupational Exposure

n-Butyl acrylate is a chemical intermediate, manufactured and processed within closed systems. The primary routes of industrial exposure to n-butyl acrylate are skin contact and inhalation. In an industrial setting, ingestion is not an anticipated route of exposure. Extensive occupational exposure monitoring records are available that indicate 8 hr TWAs for a variety of operations below the regulatory/guideline values of 2ppm (8hr TWA) for sensitization. However, peak exposures were reported primarily during sampling, cleaning, change of pump filter, check of detonation arrestors, inhibitor preparation, drumming and waste disposal. These peak exposures were above the 2ppm value and in some circumstances exceeded the NIOSH REL of 10 ppm TWA. Records indicate that personnel performing these tasks wear the appropriate personal protective equipment and therefore, exposures to personnel are estimated to be lower depending upon protection factors of the personal protective equipment (PPE).

Occupational Exposure from n-Butyl Acrylate Monomers:

A study of U.S. monomer production workers sampled from 1993 to 1995, comprised of 196 worker, showed the following geometric means (ppm): lab technicians: < 0.40; production operator: < 0.39; drumming, loading, unloading: < 0.29; and maintenance activities: < 0.38. A 1981 NIOSH Health Hazard Evaluation reported n-butyl acrylate exposures in a paint manufacturing plant to range from 0 ppm to 0.92 ppm (passive area sampling not TWA) (NIOSH HE80-68-871 Health Hazard Evaluation (1981), Belanger and Coye).

Loading, unloading and cleaning of tank cars are potential activities that could lead to dermal and inhalation exposure. These tasks are part of scheduled maintenance operations. Personnel routinely wear PPE and follow good hygiene practices to minimize exposure.

The following is a summary of data collected during 2002 from European producers indicating monitoring results during various tasks:

type of workplace	**No of samples**	**range or average (mg/m^3)**	***Range or average (ppm)***	**median (mg/m^3)**	***median (ppm)***	**Percentile 95 % (mg/m^3)**	***Percentile 95 % (ppm)***
production*	34	< 0.012 - 3.147	*< 0.002 - 0.55*	0.0326	*0.006*	2.059	*0.36*
production *	43	0.05 - 9.16	*0.0087 - 1.60*	1.180	*0.206*		
Laboratory	49	< 0.00538 - 4.635	*< 0.00094 - 0.81*	0.0297	*0.0052*	1.487	*0.26*
Laboratory	5	0.064	*0.011*				
Pilot plants	8	< 0.0109 - 0.217	*< 0.0019 - 0.037*				
storage	7	< 0.0463 - < 0.5	*< 0.008 - < 0.08*				
loading	10	< 0.05 - < 0.572	*< 0.008 - < 0.1*				
drumming	2	3.72 - 12.87	*0.65 - 2.249*	8.295	*1.45*		
maintenance/cleaning	5	0.0303 - 1.4	*0.0053 - 0.245*	0.73	*0.127*		
waste disposal	3	< 0.0744 - 6.248					
uses (processing)	245	< 0.00326 - 7.21	*< 0.0067 - 1.26*	0.0314	*0.548*	0.366	*0.064*

*routine production

Monitoring is based on 8-hr TWAs unless otherwise noted.

Single short time peak exposures (6 – 20 min.) were measuered for sampling, cleaning of sample materials, change of pump filter, check of detonation arrestors, inhibitor preparation, filter cleaning and druming between 0.46 mg/m^3 (0.08 ppm) and 61 mg/m^3 (10.6 ppm). (EBAM 2002)

Occupational Exposure from n-Butyl Acrylate Polymers:

A study of U.S. polymer production workers sampled from 1993 to 1995, comprised of 354 workers, showed the following geometric means of n-butyl acrylate (ppm): lab technicians: < 0.11; production operations: < 0.83; terminal operators: < 1.07; and maintenance activities: < 1.12.

Occupational Exposure Limits:

Current occupational exposure values for n-butyl acrylate:

ACGIH TLV	2 ppm TWA, A4, sensitizer
German MAK	2 ppm TWA, sensitizer
NIOSH REL	10 ppm TWA
OSHA PEL	None

The Danish out-door limit value (air) is 0.006 mg/m^3

2.3.2 Consumer Exposure

Since end-use consumer products contain only trace levels of acrylic acid and esters (as a result of polymerization), consumer exposure to acrylate monomers is likely to be low. (SRI, 2001)

Indirect Human Exposure:

No data are available.

3 HUMAN HEALTH HAZARDS

3.1 Effects on Human Health

3.1.1 Toxicokinetics, Metabolism and Distribution

In vitro Studies

n-Butyl acrylate was tested for relative rates of hydrolysis by a representative mammalian esterase (Porcine hepatic esterase). At concentrations of 0.2, 0.5 and 2.0 mM, conversion rates ranged between 54-69 µmoles/min/mg protein (4 – 33%) after 2 minutes, and 43-72 µmoles/min/mg protein (10 –68%) after 5 minutes of incubation at 37°C (BASF, 2001).

In vivo Studies

After oral administration, n-butyl acrylate is rapidly absorbed and metabolized in male rats (75% was eliminated as CO_2, approximately 10% via urine and 2% via feces). The major portion of n-butyl acrylate was hydrolyzed by carboxyesterase to acrylic acid and butanol and eliminated as CO_2. A smaller portion was conjugated with endogenous GSH to be subsequently excreted as mercapturic acids in the urine (Sanders, 1988).

Conclusion

n-Butyl Acrylate is rapidly hydrolyzed by carboxyesterase to acrylic acid and butanol.

3.1.2 Acute Toxicity

Studies in Animals

Inhalation

Groups of 10 rats per sex were exposed by head-nose exposure to vapor concentrations of 2.7, 3.6, 4.96, 6.8, 8.1, 12.1 and 16 mg/l for 4 hours and observed for 14 days (BASF AG, 1980). The mortality rate was 0/20, 0/20, 0/20, 1/20, 4/20, 13/20 and 20/20, respectively. Clinical signs of toxicity ranged from no symptoms in the lowest dose group; spasmodically breathing, prone position, irregular gait, eye and nasal discharge and piloerection in the middle dose groups; to dyspnea, trembling and closed eyelids in the high dose group. The 4 hour rat LC50 is 10.3 mg/l.

Dermal

The undiluted substance was applied for 24 hours to the intact skin of rabbits. The dermal rabbit LD50 values range from 2000mg/kg to 3024 mg/kg (3.36 ml/kg) body weight (Union Carbide, 1950, Union Carbide 1971).

Compilation of available LD/LC50 values:

ROUTE			RELIABILITY	REFERENCE:
Oral	LD50 rat	3143 mg/kg bw	2	BASF AG, 1958
Oral	LD50 rat	9050 mg/kg bw	2	Union Carbide, 1971
Oral	LD50 rat (male only)	3730 mg/kg bw		Union Carbide. 1950
Oral	LD50 rat	8125 mg/kg bw		Carpenter, 1974
Oral	LD50 rat	6220 mg/kg bw		Tschernikowa, 1979
Oral	LD50 rat (female/male)	4920 / 6170 mg/kg bw		Vernot, 1977
Oral	LD50 mouse	5380 mg/kg bw		Tschernikowa, 1979
Oral	LD50 mouse	7550 mg/kg bw		Tanii, 1982
Inhalation	LC50 rat	10.3 mg/l/4 h	1	BASF AG, 1980
Inhalation	LC50 rat (male only)	8.08 mg/l/4 h		Union Carbide, 1971
Inhalation	LC50 rat	25.1 mg/l/1 h	1	Union Carbide, 1989
Inhalation	LC50 rat	13.3 mg/l/4 h	2	BASF AG, 1979a
Inhalation	LC50 rat	11.9 mg/l/4 h	2	BASF AG, 1979a
Inhalation	LC50 rat	14.5 mg/l/4 h		Tschernikowa, 1979
Inhalation	LC50 mouse	6.8 mg/l/4 h	2	BASF AG, 1979a
Inhalation	LC50 mouse	7.2 mg/l/4 h	2	BASF AG, 1979a
Inhalation	LC50 hamster	8.8 mg/l/4 h	2	BASF AG, 1979b
Inhalation	LC50 hamster	6.39 mg/l/4 h	2	BASF AG, 1979b
Dermal	LD50 rabbit	2000 mg/kg bw	2	Union Carbide, 1950
Dermal	LD50 rabbit	3024 mg/kg bw	2	Union Carbide, 1971
Dermal	LD50 rabbit	5660 mg/kg bw		Vernot, 1977

Oral

Groups of 5 to 10 rats were administered doses of 1832, 2838, and 4500 mg/kg n-butyl acrylate by gavage and observed for 7 days (BASF AG, 1958). The mortality rate was 1/5, 2/5 and 8/10 in the low, mid and high dose groups, respectively. Clinical signs in the toxic doses were piloerection, prone position and, in the high dose group and labored breathing. The LD50 - rat (oral) for this study is 3143 mg/kg body weight. In another oral gavage study with male rats, a LD50 of 9050 mg/kg bw was determined (Union Carbide, 1971)

Conclusion

Animal studies with n-butyl acrylate showed a low acute toxicity after oral, dermal or inhalation uptake.

3.1.3 Irritation

n-Butyl acrylate was applied to the skin of rabbits with an occlusive covering for one minute, 5 minutes, 15 minutes and 20 hours. After 24 hours, moderate to strong erythema and edema were observed in all exposure groups. The 20-hour exposure also caused weak necrosis. The effects were reversible and much weaker 8 days after exposure (BASF AG, 1978).

0.5 ml undiluted n-butyl acrylate was instilled into the eyes of 5 rabbits (one eye per animal). Observed effects ranged from no injury in one rabbit with moderate effects in 2 rabbits and severe effects (iritis) in 2 rabbits (Union Carbide, 1971).

Conclusion

n-Butyl acrylate is from moderately to highly irritating to skin and eyes of rabbits.

3.1.4 Sensitisation

Studies in Animals

n-Butyl acrylate (purity > 99%) was positive in the Guinea Pig Maximization test. Intradermal induction was performed with 7% n-butyl acrylate while dermal induction was performed with an irritant concentration of 14% n-butyl acrylate in the vehicle methyl ethyl ketone/peanut oil (2:1). The challenge and re-challenge treatment was done with the maximum non-irritant concentration of 1.4% n-butyl acrylate in the same vehicle. Positive results were noted in 7 out of 10 animals at challenge and re-challenge (van der Walle, 1982).

The Mouse Ear Swelling Test in female B6C3F1 mice did not indicate n-butyl acrylate as a sensitizer. Sensitization with concentrations of 10, 20 or 30% n-butyl acrylate, followed by a challenge with 30% n-butyl acrylate, did not show a significant change in percent ear swelling at either 24 or 48 hours post challenge, as compared to the 30% challenge only group (NTP, Imm95005).

The same concentrations (10, 20 and 30%) were chosen for the Local Lymph Node Assay (LLNA) in B6C3F1 mice. Significant increases in lymph node proliferation was detected with the LLNA at concentrations of 20% ($p < 0.05$) and 30% ($p < 0.01$) n-butyl acrylate, whereas no effect was observed at 10% (NTP, Imm95005).

n-Butyl acrylate was positive in a series of other tests (Polak test, modified open epicutaneous test, split adjuvant test) and negative in another open epicutaneous test (BASF AG, 1958a). It should be noted that these tests often lack detailed information and, in some cases, were performed on a very few animals. In general, they support the finding that n-butyl acrylate is a skin sensitizer from a hazard standpoint. However, these animal studies are not generally useful for risk assessment based on their limitations. In addition, it was demonstrated that n-butyl acrylate is able to show cross sensitization with other acrylates. When hydroquinone is used as a polymerization inhibitor (stabilizer), this molecule does not influence the sensitizing capacity of n-butyl acrylate nor is it a skin sensitizer in the Freund's complete adjuvant test at the low concentrations present in n-butyl acrylate as an inhibitor (IUCLID data set).

Conclusion

n-Butyl acrylate showed skin sensitizing potential in animal studies.

Studies in Humans

Human skin sensitization to n-butyl acrylate was reported. Patch test concentration ranged from 0.1 to 0.5%.

6 out of 124 patients were positive, but also the author stated that those results should be interpreted with caution, due to clinical history of the patients and purity of the different tested acrylates(Kanvera, 1995). Another publication describes that a data collection of 82 patients between 1987 and 1992 suspected of occupational acrylic sensitization, showed in the patch test with 1% in petrolatum 2 patients to be sensitized to n-butyl acrylate (Guerra 1993).

Conclusion

Human skin sensitization to n-butyl acrylate was reported.

3.1.5 Repeated Dose Toxicity

Inhalation

Sprague Dawley rats (20 animals per sex and dose) were exposed by inhalation to 0, 21, 108, 211 and 546 ppm (0, 0.11, 0.57, 1.12, 2.90 mg/l) for 6 hours per day, 5 days/week for 13 weeks (BASF AG, 1978a). Clinical, clinico-chemical, hematological, gross-pathological, and histopathological examinations revealed no substance-related effects in the 21 and 108 ppm dose groups.

At 211 ppm, the test substance caused eye irritation and irritation of the nasal mucosa. Significant reductions in body weight changes (13.3 %) were observed. In clinico-chemical examinations of females, decreased potassium values and an increase in alkaline phosphatase activity were observed.

In the 546 ppm dose group, 31 of 40 animals (77%) died. Hemorrhagic discharge from eyes and noses and severe dyspnea were observed, which became constantly more severe. Many clinico-chemical and hematological parameters were affected in animals of this dose group. The animals died during exposure due to strong irritation on the respiratory tract. Metaplasia of the respiratory epithelium as far as the terminal bronchioles and proliferation of the bronchoalveolar epithelium could be detected in histopathological examinations.

The NOAEL for this study is 108 ppm (0.57 mg/l/day) and the LOAEL is 211 ppm (1.12 mg/l/day).

Chronic toxicity- Inhalation:

In a 2-year inhalation study, Sprague-Dawley rats were exposed by whole body exposure 6 hours per day, 5 days a week to 0, 15, 45 or 135 ppm (0, 0.086, 0.258, 0.773 mg/l) n-butyl acrylate. During the first 13 weeks of the study, the concentrations were lower: 0, 5, 15 or 45 ppm. The post-observation period was 6 months (BASF AG, 1985).

There were no compound-related effects on general behavior or appearance (no overt signs of toxicity and no effects on mortality). Body weight gain was normal in all groups, with only a slight decrease in food consumption in treated males and females. No compound-related effects were detected in hematological measurements or urinalysis. Organ weights were generally unaffected by treatment, except for slightly lower relative heart, kidney, liver and thyroid weights in the highest dose.

Ophthalmological examinations demonstrated localized or diffuse stippling of the corneal epithelium, cloudiness of the cornea, and various degrees of vascularization that increased with dose and duration of exposure. These effects were only significant in the highest dose group (compared with the controls), thus the NOAEL for effects on the eye is 45 ppm.

Histological changes in the nasal mucosa were dose-dependent and described as slight atrophy of the neurogenic part of the olfactory epithelium at 15 ppm, and partial loss of the columar cell layer and stratified reserve-cell hyperplasia at 45 and 135 ppm. The frequency of reserve-cell hyperplasia in nasal mucosa was 0, 10, 65, and 115 (for males and females combined) at 0, 15, 45, and 135 ppm, respectively. Males and females were affected in the same manner. No changes were detected in the posterior nasal cavity, and no irritation effects were detected on the larynx, trachea or lungs.

Examinations of tissues for neoplastic changes did not reveal any compound related increases or dose dependent effects. See section 3.1.7, Carcinogenicity.

Oral

In a 13 week-study, F344-rats (15 animals per sex and dose) received n-butyl acrylate via drinking water in concentrations of 0, 0.015, 0.09 and 0.15% (0, 12, 73, 84 mg/kg body weight per day for males and 0, 15, 91, 111 mg/kg body weight per day for females). A satellite group (5 male and 5 female rats) was given 150 mg/kg n-butyl acrylate (in corn oil) via gavage 5 days a week for 13 weeks (Gorzinski, 1982).

The only effects reported were a slight reduction in water consumption, which occurred for all dose groups, and a decrease in weight gain for male rats in the highest dose group. No abnormal hematology, clinical chemistry, urinalysis, or histopathology findings were reported.

In the gavage satellite group, the only effect observed was a slight increase in relative liver weight.

The NOAEL for the drinking water study is 84 (male) and 111 (female) mg/kg body weight per day and the NOAEL for the gavage study is 150 mg/kg bw per day (male and female.)

Conclusion

After repeated inhalation exposure, irritating effects to nasal and respiratory mucosa and the eyes predominate. No other primary systemic toxicity was observed in inhalation or oral studies.

3.1.6 Mutagenicity

In vitro Studies

n-Butyl acrylate was tested in the Ames test with Salmonella typhimurium TA98, TA100, TA1535, and TA1537 in concentrations from 3.15 up to 1000 nl/plate (2.83, 8.98, 28.3, 89.8, 283 and 898 ug/plate) with and without metabolic activation. No mutagenic and cytotoxic effects were observed (BASF AG, 1977). This result was confirmed in another Ames test in which concentrations up to 10,000 µg/plate showed no mutagenic effect when tested with and without metabolic activation (Zeiger, 1987).

A cytogenetic study was performed with Chinese Hamster Ovary cells. n-Butyl acrylate was tested in different trails without metabolic activation in the concentrations of: 5, 7.5, 10.1, 17.1, 25.2, 32.2, 37.7, 40.3 µg/ml. Concentrations of 10.1 µg/ml and higher showed a cytotoxic effect. With metabolic activation following concentrations of: 66, 132, 150, 200, 250, 267, 300, 398 µg/ml, no cytotoxicity was observed. The overall result was negative. Only in trails without S9 addition, and in concentrations where high cytotoxicity (only 5 – 50% of 200 cells could be evaluated) occurred, was a significant increase of aberrant cells found. The observed cytogenetic effect is probably due to the cytotoxicity. With metabolic activation, no increase of chromosomal aberrations was observed in any concentration tested (NTP, 1991).

In another cytogenetic study with Syrian hamster embryo (SHE) fibroblasts, no induction of micronuclei was observed in concentrations of 0.5 – 10 µg/ml without metabolic activation (Wiegand, 1989).

In an *in vitro* UDS-Test with Syrian hamster embryo fibroblasts, n-butyl acrylate was tested in concentrations from 1 – 400 µg/ml. No induction of unscheduled DNA synthesis in SHE-cells was observed (Wiegand, 1989).

In vivo Studies

n-Butyl acrylate was tested in two cytogenetic assays. In those studies, rats and hamsters were exposed by inhalation 6 hours per day for 4 consecutive days to vapor concentrations of 820 ppm

and 817 ppm, respectively. Clear signs of toxicity (dyspnea, bloody discharge from eyes and nose, deaths) were observed in both species. No increase in the rate of chromosomal aberrations was observed in either species or sex (BASF AG, 1978 b, c).

Conclusion

n-Butyl acrylate showed no genotoxic effects in *in vivo* and *in vitro* assays.

3.1.7 Carcinogenicity

In a 2-year inhalation study, Sprague-Dawley rats were exposed by whole body exposure 6 hours per day, 5 days a week to 0, 15, 45 or 135 ppm (0, 0.086, 0.258, 0.773 mg/l/day) n-butyl acrylate. During the first 13 weeks of the study, the concentrations were lower: 0, 5, 15 or 45 ppm. The post-observation period was 6 months. Results of the clinical, clinical-chemical, hematological, ophthalmological, gross pathological and histopathological examinations are described in section 3.1.5, Repeated dose toxicity. n-Butyl acrylate showed no carcinogenic effect up to the highest concentration tested of 135 ppm (0.773 mg/l/day). (BASF AG, 1985).

Conclusion

n-Butyl acrylate was not carcinogenic to rats via inhalation up to 135 ppm (0.773 mg/l/day).

3.1.8 Toxicity for Reproduction

Effects on Fertility

In the subchronic inhalation study with rats (BASF AG, 1978a) described in section 3.1.5, Repeated Dose Toxicity, extensive pathological and histopathological examinations of the gonads were performed. Sprague-Dawley rats were exposed to 0, 21, 108, 211 and 546 ppm (0, 0.11, 0.57, 1.12, 2.90 mg/l) n-butyl acrylate 6 hours per day, 5 days per week for 13 weeks. In males of the high dose group, severe toxicity was observed; the relative testes weight was increased, which was related to body weight reduction. No effects were found in the seminal vesicles, prostate, epididymis, uterus, testes, or ovary upon microscopic examination.

Conclusion

n-Butyl acrylate showed no toxic effect to reproductive organs at the significantly toxic doses to rats.

Developmental Toxicity

Oral

In a gavage study, pregnant CD-1 mice were administered n-butyl acrylate dissolved in cottonseed oil. Concentrations of 0, 100, 1000, 1500, 2000, 2500, 3000 and 4000 mg n-butyl acrylate/kg bw were administered from gestation day 6 to 15. No animals survived in the high dose group. At 3000 and 2500 mg/kg, 2 of 30 animals died; at 2000 mg/kg 1 of 29 died; at 1500 mg/kg, 1 of 27 died; and at 1000 mg/kg, 1 of 30 died. At the 1500 mg/kg dose and higher, average maternal body weight gain was significantly reduced.

Fetal body weights were significantly reduced at doses of 1500 mg/kg and above. At 2500 and 3000 mg/kg, the percentage of resorptions was significantly increased.

At 100 mg/kg, 1000 mg/kg, 1500 mg/kg and 2000 mg/kg, and in the control group, variations and malformations occurred sporadically on different sides (i.e. single cases of cleft palate, fused ribs,

fused sternebrae, fused arches, extra arches, branched ribs) in a non-dose-dependent manner, with a slight dose-dependent increase when taking the sum of all events per dose group together. In the 2500 mg/kg and 3000 mg/kg groups, the number of fetuses with external and skeletal malformations and variations (cleft palate, exencephaly, open eyes, fused arch's, fused ribs) was significant increased (Rohm and Haas Co., 1982).

Taking maternal mortality and reduced weight gain into account; the NOAEL for maternal toxicity was 100 mg/kg. The NOAEL for developmental toxicity was 1000 mg/kg and the NOAEL for teratogenicity was 2000 mg/kg.

Inhalation

Sprague Dawley rats were exposed to n-butyl acrylate concentrations of 25, 135 and 250 ppm (0.13; 0.72; 1.33 mg/l) for 6 hours per day on days 6 to 15 of gestations (BASF AG, 1979).

Inhalation of 135 and 250 ppm of the test substance caused a significant reduction in maternal body weight gain, as well as irritation to the nose and eyes. At the end of the exposure period, the weight gain was comparable to the controls. The two highest exposure concentrations caused embryo lethality, as evidenced by a dose-dependent increase in post-implantation loss. The 25-ppm dose did not lead to any signs of maternal toxicity or embryo lethality. No signs of organ changes or skeletal abnormalities were observed in the fetuses at any concentration.

The NOAEL for maternal and developmental toxicity was 25 ppm, and the NOAEL for teratogenicity was 250 ppm.

In 1999 study, groups of 20-29 pregnant female Sprague Dawley rats were exposed to n-butyl acrylate concentrations of 100, 200 and 300 ppm (0.53; 1.06; 1.6 mg/l) for 6 hours per day on days 6 through 20 of gestation (Saillenfait, 1999).

A NOAEL for maternal toxicity could not be determined since the absolute weight gain was significantly reduced in all dose groups in a concentration-related manner. No treatment-related effects were reported in terms of numbers of implantation sites, live fetuses, non-live implants or resorptions. Fetal body weight was significantly reduced at 200 and at 300 ppm. A few sporadic malformations were seen in the 300 ppm and the control group. There was no evidence of treatment-related effects on the incidence of external and visceral variations. The incidence of individual skeletal variations (mainly incomplete ossification of sternebrae and of vertebral centra) was similiar in the control and treated groups.

The NOAEL for maternal toxicity could not be identified; the LOAEL was 100 ppm. The NOAEL for developmental toxicity was 100 ppm and the NOAEL for teratogenicity was 300 ppm.

Conclusion

After inhalation, n-butyl acrylate caused fetotoxic effects only at high maternal toxic doses. No teratogencity occurred after inhalation of n-butyl acrylate in animal studies. After oral gavage at very high doses (2500 mg/kg) to mice, n-butyl acrylate caused malformations, only in the presence of maternal toxicity. At concentrations where maternal toxicity was not observed, n-butyl acrylate did not cause developmental toxicity or teratogenicity.

3.2 Initial Assessment for Human Health

After oral administration, n-butyl acrylate is rapidly absorbed and metabolized in male rats (75% was eliminated as CO_2, approximately 10% via urine and 2% via feces). The major portion of n-butyl acrylate was hydrolyzed by carboxyesterase to acrylic acid and butanol.

Following acute exposure, n-butyl acrylate exhibits low toxicity. n-Butyl acrylate has oral LD50s of 3143 mg/kg bw (rats) and 9050 mg/kg bw (male rats), an inhalation LC50 (4-hour, rat) of 10.3 mg/L and a dermal LD50 (rabbit) of 2000 to 3024 mg/kg. n-Butyl acrylate is irritating to skin and eyes and showed a skin sensitizing potential in animals. In humans, skin sensitization to butyl acrylate was reported.

In an oral (drinking water) 90-day study in rats, using a satellite group (gavage) at 150 mg/kg bw/day, the only effects reported were a slight reduction in water consumption in all dose groups and a decrease in weight gain in the highest dose group. The NOAEL (males) = 84 mg/kg/bw/day and NOAEL (females) = 111 mg/kg/bw/day. The NOAEL (gavage) (males and females) 150 mg/kg/bw/day. In a 90-day inhalation study, rats were exposed to 0, 21, 108, 211, and 546 ppm (0, 0.11, 0.57, 1.12, 2.90 mg/L) n-butyl acrylate. The primary effects at 211 ppm (1.12 mg/L) were irritation of eyes and nasal mucosa, reduced body weights (13.3 percent in males and 3.76 percent in females compared with controls), decreased potassium values (females) and an increase in alkaline phosphatase activity (females.) At the highest dose of 546 ppm (2.90 mg/L) 31 of 40 animals died. The primary cause of death was due to the strong irritation of the substance on the respiratory tract. The NOAEL = 108 ppm (0.57 mg/L/day) and the LOAEL = 211 ppm (1.12 mg/L/day.). In a two –year inhalation study, rats (male/female) received whole body exposures of 0, 15, 45, or 135 ppm (0, 0.086, 0.258, 0.773 mg/L). There was a slight decrease in food consumption and slightly lower relative heart, kidney, liver and thyroid weights at the highest dose. A NOAEL was determined to be 45 ppm (0.258 mg/L/day) based upon localized and diffuse stippling of the corneal epithelium, cloudiness of the cornea, and various degrees of vascularization. The severity of nasal mucosa effects increased with dose and occurred at all doses in males and females. Effects ranged from slight atrophy of the neurogenic part of the olfactory epithelium at 15 ppm (0.086 mg/L) to partial loss of the columnar cell layer and stratified reserve-cell hyperplasia at 45 (0.258 mg/L) and 135 ppm (0.773 mg/L).

n-Butyl acrylate was negative in the Ames test with Salmonella typhimurium TA98, TA100, TA1535 and TA1537 with and without metabolic activation tested up to 10,000 µg/plate. In a cytogenetic assay with Chinese Hamster Ovary Cells, n-butyl acrylate showed no clastogenic potential in concentrations where no cytotoxicity occurred. Without metabolic activation an increase of aberrant cells was observed at cytotoxic concentrations. No genotoxic effects were found in an *in vitro* micronucleus test and an UDS-test with Syrian hamster fibroblasts. In *in vivo* cytogenetic assay, n-butyl acrylate showed no clastogenic effect in rats and hamsters after inhalation exposure.

n-Butyl acrylate was not carcinogenic to rats via inhalation up to 135 ppm (0.773 mg/L/day), the highest dose tested.

No reproductive toxicity studies are available. However, in repeated-dose studies (noted above), no effects were seen in the reproductive organs. In developmental toxicity studies with rats via inhalation, n-butyl acrylate caused fetotoxic effects (resorptions and reduced number of live fetuses at $\geq$135 ppm) at maternally toxic concentrations. At exposures of 25, 135 and 250 ppm (0.13, 0.72 and 1.33 mg/L/day), the NOAEL (maternal) = 25 ppm (0.13 mg/L/day) based on reduced body weights and irritation to the eyes and nose. The NOAEL (developmental) = 25 ppm (0.13 mg/L/day), based on post-implantation loss and the NOAEL (teratogenicity) = 250 ppm. In a separate study, female rats were given 100, 200 and 300 ppm. A maternal NOAEL could not be determined based on a reduction of absolute body weight gain at all doses; the maternal LOAEL was set at 100 ppm. At 200 and 300 ppm there was a reduction in fetal body weights. Sporadic malformations occurred at 300 ppm and in the control group. The NOAEL (developmental) was 100 ppm and the NOAEL (teratogenicity) was 300 ppm (highest dose tested).

4 HAZARDS TO THE ENVIRONMENT

4.1 Aquatic Effects

Acute Toxicity Test Results

The following acute toxicity tests with aquatic organisms are available for n-butyl acrylate and the structural related iso-butyl acrylate.

Organism	Endpoint	Result	Reference
Fish (freshwater): n-butyl acrylate			
Cyprinodon variegatus,	96 hr-LC50 (flow-through)	2.1 mg/L (measured)	Drottar, 1996
Salmo gairdneri,	96 hr-LC50 (flow-through)	5.2 mg/L (measured)	Bowmann, 1990
Fish	96 hr-LC50	1.786 mg/L (calculated with ECOSAR)	BASF, 2002e
Fish (freshwater): i-butyl acrylate			
Pimephales promelas	96 hr-LC50 (flow-through)	2.09 mg/L (measured)	Russom et al, 1988
Pimephales promelas	96 hr-LC50 (static)	10-20 mg/L (nominal)	Dow Chemical,1992
Leuciscus idus	96 hr-LC50 (static)	22 mg/L (nominal)	BASF, 1989
Fish	96 hr-LC50	1.838 mg/L (calculated with ECOSAR)	BASF, 2002e
Daphnia: **n-butyl acrylate**			
Daphnia magna	48 hr-EC50 (flow-through)	8.2 mg/L (measured)	Burgess, 1990
Daphnid	48 hr-EC50	9.810 mg/L (calculated with ECOSAR)	BASF, 2002e
Daphnia: **iso-butyl acrylate**			
Daphnia magna	48 hr-EC50	9.7mg/L(nominal; immobilization)	BASF 1988a,
Daphnia magna	48 hr-EC50	19.8 mg/L(nominal ; immobilization)	BASF 1991
Daphnid	48 hr-EC50	10.653 mg/L (calculated with ECOSAR)	BASF, 2002e
Algae: **n-butyl acrylate**			
Selenastrum capricornutum	96 hr-EC50 (growth rate)	2.65* mg/L (calculated based on measured values at 0 h and 96 h, arithmetic mean)	Forbis, 1990
Algae	96 hr-EC50	1.023 mg/L (calculated with ECOSAR)	BASF, 2002e
Algae: **iso-butyl acrylate**			
Desmodesmus subspicatus	72 hr-EC50 (biomass)	3.18 mg/L (measured)	BASF 2002f
	72 hr-EC50 (growth rate)	5.28 mg/L (measured	
Algae	96 hr-EC50	1.107 mg/L (calculated with ECOSAR)	BASF, 2002e
Microorganisms: n-butyl acrylate			
Activated sludge (industrial)	3 days-EC0	>150 ** mg/L(nominal)	Schaefer, 1995
Microorganisms: iso-butyl acrylate			
Activated sludge, domestic	30 min-EC50	>1000 ** mg/L (nominal, OECD 209)	BASF 2001a

* Analytic measurements were taken at 0 h and 96 h, whereas after 96 h the substance concentration was below the detection limit of 0.1 mg/L at all tested concentrations

Due to the volatility of the test substances measured values are more preferable than nominal values, Therefore nominal values are only shown in addition to complete the data base. In some instances (specify) only nominal values are available. As a result, in order to assist in the presenteation of the data, values were estimated using EPIWIN /ECOSAR

The fish and daphnia testing with n-butyl acrylate were performed using measured concentrations. During algal testing analytical measurements were performed at 0 h and 96 h, after 96 h the substance concentration was below the detection limit (0.1 mg/L) in all concentrations. The loss of test substance was reported to have occurred in the open test system due to the test substances volatility. Therefore, in the original report the algae EC50 value of 5.2 mg/L was calculated using nominal concentrations. To get a more realistic EC50 value a recalculation was performed based on the measured values (0 h and 96 h) using the arithmetic mean. The resulting EC50 value calculated as arithmetic mean based on measured concentrations of 2.65 mg/L is consistent with SAR EPIWIN/ECOSAR model predicted value of 1.023 mg/L and the measured EC50 value of the structural similar iso-butyl acrylate which has a 48hr-EC50 Desmodesmus subspicatus of 5.28 mg/L (BASF AG, 2002e)

Chronic Toxicity Test Results

No prolonged or chronic studies are available.

Conclusion

Based on these data, n-butyl acrylate is considered toxic to aquatic organisms.

4.2 Terrestrial Effects

No data available.

Conclusion

Based on distribution modeling using Mackay Level I, the amount that would be distributed to soil or sediment is negligible; therefore, no data on terrestrial effects are needed.

4.3 Other Environmental Effects

No data available.

Conclusion

All required SIDS endpoints have been completed. Acute aquatic toxicity values range from 2.1 – 8.2 mg/L across tested species indicating a concern for toxicity if n-butyl acrylate were to be released into the water compartment. Based on release data, n-butyl acrylate is primarily released to the air compartment and its atmospheric half-life is 1.2 days. It is readily biodegradable and has a BCF of 13. In addition, the chemical is primarily used as a chemical intermediate in the production of polymers.

4.4 Initial Assessment for the Environment

The water solubility of n-butyl acrylate is 2 g/L (25 °C) and specific gravity is 0.898 g/cm^3 at 20 °C. The measured log Kow is 2.38 at 25^{o}C. The vapor pressure (based on a regression analysis of measured values from several data sources) is 7.27 hPa at 25 °C. The melting point is - 64°C and the boiling point is 148 °C. The chemical is highly flammable and its flashpoint is approximately 36 ^{0}C. n-Butyl acrylate is photodegraded by reaction with hydroxyl radicals in the atmosphere with

a half-life of 1.2 days (calculated). The hydrolysis rate of n-butyl acrylate is extremely low. At pH 7, the approximate half-life is calculated to be 1100 days. The Henry's Law constant is 4.7 x 10^{-4} atm/m^3/mol, indicating the potential for moderate volatilization from water. Distribution modeling using Mackay Level I indicates that the main target compartment will be air (94 %) with smaller amounts partitioning into water (5.73 %) soil (0.11 %), and sediment (0.11 %). Fugacity model Level III gives comparable results; the levels are: 89.4 % (air), 8.24 % (water), 2.39 % (soil) and 0.0963 % (sediment). A BCF of 13 was determined, based on a log K_{ow} of 2.38, indicating a low bioaccumulation potential. In a biodegradation assay according to OECD Guideline 301 C (modified MITI-Test (I)) n-butyl acrylate was readily biodegradable (61 % after 14 days). In another ready biodegradation test conducted according to OECD Guideline 301D, 57.8 percent of the chemical biodegraded after 28 days. In acute aquatic toxicity studies, n-butyl acrylate was determined to have toxic effects in the concentration range of 2.1 to 8.2 mg/L. A measured fish 96-hr LC50 of 2.1 mg/L was determined in a flow-through test in *Cyprinodon variegates.* A measured aquatic invertebrate 48-hr EC50 of 8.2 mg/L was determined in a flow-through test in *Daphnia magna.* Finally, in algae (*Selenastrum capricornutum*) a growth-rate study using measured concentrations resulted in a 96-hr EC50 of 2.6 mg/L (arithmetic mean). In addition, supporting data from iso-butyl acrylate indicate toxicity values with in the same ranges. For iso-butyl acrylate, the most sensitive species was the freshwater fish *Pimephales promelas* (fathead minnow) with a 96-hour LC50 of 2.09 mg/L (measured). The 48-hour EC50 for *Daphnia magna* is 9.7 mg/L (nominal), and for algae (*Desmodesmus subspicatus)* the 72-hour EC50s were 3.18 mg/L (measured) for biomass and 5.28 mg/L (measured) for growth rate.

Exposure

n-Butyl acrylate is manufactured as a chemical intermediate in a closed system. Its major use is in the production of homo- and co-polymers with other monomers (i.e. acrylic acid and its salts, esters, amides, etc.) to produce emulsion polymers. The three major uses of acrylate esters are: surface coatings, adhesives/sealants and textiles. In 2000, production volumes were 250,000 – 400,000 tonnes for Europe, 581,000 tonnes for the US and 130,000 tonnes for Japan. In 2000, US TRI reporting indicates that the majority of n-butyl acrylate is released to the air compartment (94%, 233,013 pounds) where it is subject to photolysis. However, a small percentage is released to the water compartment (6%, 14,566 pounds). Impact on the environment is expected to be low due to photolysis and biodegraditive properties. Extensive occupational exposure monitoring records are available which indicate that 8 hr TWAs for a variety of operations are below the regulatory/guideline values of 2 ppm (8hr TWA) . However, peak exposures were reported above the 2 ppm value and in some circumstances exceeded the NIOSH REL of 10 ppm (TWA) during sampling, cleaning, change of pump filter, check of detonation arrestors, inhibitor preparation, drumming and waste disposal. Records indicate that personnel performing these tasks wear the appropriate personal protective equipment and therefore, exposures to pesonnel are estimated to be lower depending upon protection factors of the personal protective equipment. End-use consumer products contain only trace levels of acrylic acid and esters (as a result of polymerization). Therefore, consumer exposure to acrylate monomers is likely to be low.

5 RECOMMENDATIONS

The chemical is currently of low priority for further work.

The chemical possesses properties indicating a hazard for human health and the environment. Based on data presented by the Sponsor country, exposure to humans and the environment is anticipated to be low, and therefore this chemical is currently a low priority for further work. Countries may desire to investigate any exposure scenarios that were not presented by the Sponsor country.

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I U C L I D
D a t a S e t

Existing Chemical	ID: 141-32-2
CAS No.	141-32-2
EINECS Name	butyl acrylate
EC No.	205-480-7
Index number	607-062-00-3
Molecular Formula	C7H12O2

Producer Related Part	
Company:	BASF AG
Creation date:	07-AUG-2001
Substance Related Part	
Company:	BASF AG
Creation date:	07-AUG-2001
Memo:	master
Printing date:	19-JAN-2004
Revision date:	
Date of last Update:	**16-JAN-2004**
Number of Pages:	**139**
Chapter (profile):	Chapter: 1, 2, 3, 4, 5, 6, 7, 8, 10
Reliability (profile):	Reliability: without reliability, 1, 2, 3, 4
Flags (profile):	Flags: without flag, confidential, non confidential, WGK (DE), TA-Luft (DE), Material Safety Dataset, Risk Assessment, Directive 67/548/EEC, SIDS, BPD Notification

1.0.1 Applicant and Company Information

Name: Atochem
Town: 92080 Paris la Defense
Country: France

Flag: non confidential
16-APR-2003

Name: BAMM
Street: 1250 Connecticut Avenue, NW, Suite 700
Town: 20036 Washington, DC
Country: United States
Phone: (202) 637-9040
Telefax: (202) 637-9178

16-APR-2003

Name: BASF AG
Street: Karl-Bosch-Str
Town: 67056 Ludwigshafen
Country: Germany

Flag: non confidential
16-APR-2003

Name: Hoechst Celanese NV
Street: C/O Oude Maasweg 6
Town: 3197 KJ Rotterdam
Country: Netherlands

Flag: non confidential
16-APR-2003

Name: Huels AG
Street: Postfach
Town: 45764 Marl
Country: Germany

Flag: non confidential
16-APR-2003

Name: Mitsubishi International GmbH
Street: Kennedydamm 19
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Country: Germany

Flag: non confidential
16-APR-2003

Name: Rohm and Haas France S.A.
Street: 371 rue L. van Beethoven
Town: 06565 Valbonne
Country: France

Flag: non confidential
16-APR-2003

Name: Union Carbide Benelux
Street: Norderlaan 147

Town: 2030 Antwerpen
Country: Belgium

Flag: non confidential
16-APR-2003

Type: cooperating company
Name: UNION CARBIDE CORPORATION
Street: 1290 Hercules, Suite 202
Town: TX 77058 Houston
Country: United States
Phone: 281-280-3519
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16-APR-2003

Type: cooperating company
Name: UNION CARBIDE CORPORATION
Street: 1290 Hercules, Suite 202
Town: TX 77058 Houston
Country: United States
Phone: 281-280-3519
Telefax: 281-280-3538

16-APR-2003

1.0.2 Location of Production Site, Importer or Formulator

Name of Plant: Union Carbide Corporation
Street: 1290 Hercules, Suite 202
Town: TX 77058 Houston
Country: United States
Phone: 281-280-3519
Telefax: 281-280-3538

16-APR-2003

Name of Plant: Union Carbide Corporation
Street: 1290 Hercules, Suite 202
Town: TX 77058 Houston
Country: United States
Phone: 281-280-3519
Telefax: 281-280-3538

16-APR-2003

1.0.3 Identity of Recipients

1.0.4 Details on Category/Template

1.1.0 Substance Identification

Mol. Formula: C7 H12 O2
Mol. Weight: 128.17 g/mol

Flag: non confidential
16-APR-2003

1.1.1 General Substance Information

Purity type: typical for marketed substance

Substance type: organic
Physical status: liquid

Remark: Typical commercial samples of n-butyl acrylate have purity of > 99.5% (w/w) and may contain specific impurities: water (</= 0.05%) and acid (</= 0.01%, calculated as acrylic acid) In commerial products mequinol is added 15 +/- 5 ppm.
Flag: Critical study for SIDS endpoint
31-JUL-2002 (1)

Substance type: organic
Physical status: liquid
Purity: <= 100 - % w/w

Remark: >=10 <=120 ppm of Methyl Ether of Hydroquinone (CAS No. 150-76-5) as an inhibitor.
30-JUL-2002 (2)

Substance type: organic
Physical status: liquid
Colour: yellowish
Odour: fruity

Flag: non confidential
16-APR-2003 (3)

1.1.2 Spectra

1.2 Synonyms and Tradenames

2-Propenoic acid, butyl ester (9CI)

Flag: non confidential, Critical study for SIDS endpoint
23-OCT-1995

Acrylic acid butyl ester (6CI, 8CI)

Flag: non confidential, Critical study for SIDS endpoint
23-OCT-1995

Acrylic acid n-butyl ester, Butyl 2-propeonate

Flag: non confidential
23-OCT-1995

ACRYLIC ACID NORMAL-BUTYL ESTER

Flag: non confidential
23-OCT-1995

Acrylsaeurebutylester

Flag: non confidential
23-OCT-1995

Butyl 2-propenoate

Flag: non confidential
23-OCT-1995

Butyl acrylate

Flag: non confidential
23-OCT-1995

Butyl Acrylate ; Acrylic acid butyl ester

Flag: non confidential
23-OCT-1995

Butyl ester acrylic acid

Flag: non confidential
11-AUG-1999

Butyl Propenoate

Flag: non confidential, Critical study for SIDS endpoint
10-AUG-1999

butyl propenoate

Flag: non confidential
23-OCT-1995

N-Butyl Acrylate

Flag: non confidential, Critical study for SIDS endpoint
04-SEP-2001

n-butyl acrylate

Flag: non confidential
16-APR-2003

N-BUTYL-2-PROPENOATE

Flag: non confidential
23-OCT-1995

n-Butylacrylat

Flag: non confidential
23-OCT-1995

UN 2348

Flag: non confidential
10-AUG-1999

ZMATLTXT

Flag: non confidential
10-AUG-1999

1.3 Impurities

CAS-No: 590-01-2
EC-No: 209-669-5
EINECS-Name: butyl propionate

Mol. Formula: C7 H14 O2
Contents: < .3 - % w/w

Flag: non confidential, Critical study for SIDS endpoint
16-APR-2003

CAS-No: 7732-18-5
EC-No: 231-791-2
EINECS-Name: water
Mol. Formula: H2O
Contents: < .1 - % w/w

Flag: non confidential, Critical study for SIDS endpoint
16-APR-2003

CAS-No: 79-10-7
EC-No: 201-177-9
EINECS-Name: acrylic acid
Mol. Formula: C3 H4 O2
Contents: < .01 - % w/w

Flag: non confidential, Critical study for SIDS endpoint
16-APR-2003

1.4 Additives

CAS-No: 150-76-5
EC-No: 205-769-8
EINECS-Name: mequinol
Mol. Formula: C7 H8 O2

Remark: synonyms: 4-methoxyphenol; hydroquinone monomethyl ether
Flag: non confidential, Critical study for SIDS endpoint
16-APR-2003

1.5 Total Quantity

Quantity: 100000 - 500000 tonnes produced in 2000

Remark: Production in Europe
Reliability: (1) valid without restriction
Flag: non confidential, Critical study for SIDS endpoint
31-JUL-2002

Quantity: ca. 581000 tonnes produced in 2000

Remark: US production in 2000
Reliability: (1) valid without restriction
Flag: non confidential, Critical study for SIDS endpoint
31-JUL-2002

Quantity: ca. 130000 tonnes produced in 2000

Remark: Japanese production in 2000
Reliability: (1) valid without restriction
Flag: non confidential, Critical study for SIDS endpoint
31-JUL-2002

1.6.1 Labelling

Labelling: as in Directive 67/548/EEC
Symbols: (Xi) irritating
Nota: (D) Certain substances which are susceptible in spontaneous polymerisation or decomposition are generally placed on the market in a stabilized form. It is in this form that they are listed in Annex 1 to this Directive
Specific limits: no
R-Phrases: (10) Flammable
(36/37/38) Irritating to eyes, respiratory system and skin
(43) May cause sensitization by skin contact
S-Phrases: (9) Keep container in a well-ventilated place

Remark: INDEX-No. 607-062-00-3
Flag: non confidential
16-APR-2003 (4)

1.6.2 Classification

Classified: as in Directive 67/548/EEC
Class of danger: flammable
R-Phrases: (10) Flammable
Specific limits: no

Remark: INDEX-No. 607-062-00-3
Flag: non confidential
16-APR-2003 (4)

Classified: as in Directive 67/548/EEC
Class of danger: irritating
R-Phrases: (36/37/38) Irritating to eyes, respiratory system and skin
Specific limits: no

Remark: INDEX-No. 607-062-00-3
Flag: non confidential
16-APR-2003 (4)

Classified: as in Directive 67/548/EEC
Class of danger: sensitizing
R-Phrases: (43) May cause sensitization by skin contact
Specific limits: no

Remark: INDEX-No. 607-062-00-3
Flag: non confidential
16-APR-2003 (4)

1.6.3 Packaging

1.7 Use Pattern

Remark: n-Butyl acrylate is used to prepare homopolymers and copolymers with other monomers such as acrylic acid and its salts, amides and esters; methacrylates, acrylonitrile, maleic acid esters, vinyl acetate, vinyl chloride, styrene, butadiene, unsaturated polyesters and drying oils. These polymers anc copolymers are used in a variety of products as dispersions or solutions.

Butyl acrylate is used in the production of coatings and inks, adhesives, sealants, textiles, plastics and elastomers. Coatings applications include: architectural latex coatings, water based dispersions and automotive original equipment manufacture and refinish materials. Pressure sensitive adhesives contain butyl acrylate; other adhesive applications are found in the textile and construction industries. Textile industry products which contain buty acrylate are fibers, warp sizings, thickener, and back coat formulations; in the plastics industry, butyl acrylate is found in some PVC modifiers and molding or extrusion additives

Flag: non confidential, Critical study for SIDS endpoint
31-JUL-2002 (5) (1)

Type: type
Category: Non dispersive use

Flag: confidential
16-APR-2003

Type: type
Category: Use in closed system

Flag: confidential
16-APR-2003

Type: industrial
Category: Chemical industry: used in synthesis

Flag: non confidential
16-APR-2003

Type: industrial
Category: Paints, lacquers and varnishes industry

Flag: non confidential
16-APR-2003

Type: industrial
Category: Polymers industry

Flag: non confidential
16-APR-2003

Type: use
Category: Cosmetics

Flag: non confidential
16-APR-2003 (3)

Type: use
Category: Intermediates

Flag: non confidential
16-APR-2003

Type: use
Category: Pharmaceuticals

Flag: non confidential
16-APR-2003 (3)

Type: use
Category: other: monomers

Flag: non confidential
16-APR-2003

1.7.1 Detailed Use Pattern

1.7.2 Methods of Manufacture

1.8 Regulatory Measures

1.8.1 Occupational Exposure Limit Values

Type of limit: MAK (DE)
Limit value: 2 ml/m3

Country: Germany
Remark: skin sensitizing
Reliability: (1) valid without restriction
Flag: non confidential, Critical study for SIDS endpoint
16-APR-2003

Type of limit: TLV (US)
Limit value: 2 ml/m3

Remark: A4, sensitizer
Reliability: (1) valid without restriction
Flag: non confidential, Critical study for SIDS endpoint
31-JUL-2002

Type of limit: other: NIOSH REL
Limit value: 10 ml/m3

Flag: non confidential, Critical study for SIDS endpoint
31-JUL-2002

Type of limit: other: OSHA PEL
Limit value: 10 ml/m3

Flag: non confidential, Critical study for SIDS endpoint
31-JUL-2002

Type of limit: MAK (DE)
Limit value: 55 mg/m3
Short term exposure
Limit value: 110 mg/m3
Schedule: 5 minute(s)
Frequency: 8 times

Country: Germany
Flag: non confidential
16-APR-2003 (6)

Type of limit: MAK (DE)
Limit value: 10 ml/m3
Short term exposure

Limit value: 20 ml/m3
Schedule: 5 minute(s)
Frequency: 8 times

Country: Germany
Remark: sensitizing
Flag: non confidential
16-APR-2003 (7)

Type of limit: MAK (DE)
Limit value: 10 ml/m3
Short term exposure
Limit value: 20 ml/m3
Schedule: 5 minute(s)
Frequency: 8 times

Country: Germany
Remark: danger of sensitizing
pregnancy group D
Flag: non confidential
16-APR-2003 (8)

Type of limit: MAK (DE)
Limit value: 10 ml/m3

Country: Germany
Remark: Odor threshold: 0.01 (reference: manufacturer specification) - 0.2 ppm (reference: Kühn, Birett).
Flag: non confidential
16-APR-2003 (9)

Type of limit: TLV (US)

Remark: Union Carbide Recommendation: 5 ppm TWA
Flag: non confidential
16-APR-2003

Type of limit: TLV (US)

Remark: Limit value: 10 ppm
Flag: non confidential
16-APR-2003 (10)

1.8.2 Acceptable Residues Levels

1.8.3 Water Pollution

Classified by: other: VwVwS (Germany), Annex 2
Labelled by: other: VwVwS (Germany), Annex 2
Class of danger: 1 (weakly water polluting)

Country: Germany
Flag: non confidential
16-APR-2003 (3)

1.8.4 Major Accident Hazards

Legislation: Stoerfallverordnung (DE)
Substance listed: yes

Country: Germany

Remark: Annex IV (Cat. 7; flammable liquids)
Flag: non confidential
16-APR-2003 (11)

1.8.5 Air Pollution

Classified by: TA-Luft (DE)
Labelled by: TA-Luft (DE)
Number: 3.1.7 (organic substances)
Class of danger: I

Country: Germany
Flag: non confidential
16-APR-2003 (3)

1.8.6 Listings e.g. Chemical Inventories

Type: TSCA

Remark: EINECS No. 205-480-7
ENCS No. 2-989X
ECL Serial No. KE-29450
INVENTORY NAMES:
2-Propenoic acid, butyl ester (TSCA, DSL, ENCS, AICS)
Acrylate de butyle (French) (DSL, EINECS)
butyl acrylate (EINECS)
Butylacrylat (German) (EINECS)
2-Propenoic acid butyl ester (ECL)
Flag: non confidential
16-APR-2003 (12)

1.9.1 Degradation/Transformation Products

1.9.2 Components

1.10 Source of Exposure

Remark: As the quantities of this substance placed on the EU market by Union Carbide Benelux N.V. are normally sourced from the manufacturing facilities of its U.S. parent company, no exposure can arise within the EU form the manufacture of these quantities. The comments below on exposure are restricted to uses for which Union Carbide believes its customers use this substance.

Major use(s): Chemical intermediate in the manufacture of acrylic polymers and dispersions.

Sources of human exposure: Negligible during use as chemical intermediate, assuming that appropriate industrial hygiene and personal protective precautions are observed.

Sources of environmental exposure: Negligible release to water compartment from wastes arising from use as chemical intermediate and residues in acrylic dispersions used in paints.
Flag: confidential
16-APR-2003

Remark: Continuous process.
Esterification of acrylic acid by n-butanol
Separation by liquid/liquid extraction.
Purification by distillation.
Heavy ends: incineration
Effluents: biological treatment plant
Flag: confidential
16-APR-2003

Source of exposure: Human: exposure by production

Remark: No specific informations/datas. Potential exposure sources are aerosol (mist), aqueous solutions, fume.
Flag: non confidential
16-APR-2003

1.11 Additional Remarks

Memo: Conditions to avoid:

Remark: - Avoid heat
- Avoid oxygen content above the product of less than 5 %.
- Avoid UV-light and other radiation with high energy
- Avoid direct sunlight
- Avoid prolonged storage
- Avoid inhibitor loss
- Avoid excessive temperatures
Flag: non confidential
16-APR-2003 (3)

Memo: German "Flammable Liquids" classification (VbF): A II

Country: Germany
Flag: non confidential
16-APR-2003 (3)

Remark: Disposal: Dilute with a suitable solvent and incinerate in a furnace where permitted under appropriate national and local regulations.
Water solution containing no more than 10 ppm of butyl acrylate have been degraded in acclimated biological systems; a 150 ppm concentration can be toxic to biological systems.

Transport: Butyl acrylate is a class 3 product according theADR/RID/IMDG/ICAO regulations.
The substance is shipped in road/rail tankcars, tankcontainers/ISOtanks and smaller packages (e.g. drums).
The substance has to be (un)loaded with a vapour return line.

Inhibitors/Stabilizers:
This product is inhibited with 10 to 20 ppm MEHQ (monomethylether of hydroquinone).
Flag: non confidential
16-APR-2003

1.12 Last Literature Search

Type of Search: Internal and External
Chapters covered: 5.10
Date of Search: 13-NOV-2002

06-FEB-2003

Chapters covered: 1
Date of Search: 16-APR-2003

Remark: update 2003
Flag: non confidential
16-APR-2003

1.13 Reviews

2.1 Melting Point

Value: ca. -64 degree C
Decomposition: no at degree C
Sublimation: no

Method: other: BS 523/1964

Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
12-AUG-2002 (13) (14)

Value: = -64 degree C

Method: other: ASTM D-1177
Year: 1998
GLP: no

Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-JUL-2002 (2)

Value: ca. -65 degree C
Decomposition: no at degree C
Sublimation: no
29-JUL-2002 (9)

2.2 Boiling Point

Value: ca. 148 degree C
Decomposition: no

Method: other: DIN 51 751

Reliability: (2) valid with restrictions
measured according guideline
Flag: Critical study for SIDS endpoint
31-JUL-2002 (13)

Value: = 145 degree C

Result: = 145 degrees C
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-JUL-2002 (15)

Value: = 148 degree C at 1013 hPa
Decomposition: no
23-OCT-1995 (9)

Value: = 148.8 degree C at 1013 hPa

Method: other
Year: 1998
GLP: no

10-AUG-1999 (2)

2.3 Density

Type: density
Value: = .898 g/cm³ at 20 degree C

Method: other: DIN 51 757

Flag: Critical study for SIDS endpoint
31-JUL-2002 (13) (14)

Type: density
Value: = .9 g/cm³ at 20 degree C

Method: other: ASTM D-4052
Year: 1998
GLP: no

Flag: Critical study for SIDS endpoint
31-JUL-2002 (2)

Type: density
Value: ca. .899 g/cm³ at 20 degree C

31-JUL-2002 (9)

2.3.1 Granulometry

2.4 Vapour Pressure

Value: 7.27 hPa at 25 degree C

Method: other (calculated)

Remark: regression calculation with data of following publications: Stull, D.R. Vapor Pressure of Pure Substances, Ind.Eng.Chem.39, 517 (1947) and Riddle,E.H., Monomeric Acrylic Esters, Reinhold Publishing Corp. New York (1954)
Result: 5.45 mmHg = 7.27 hPa
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-JUL-2002 (16) (17)

Value: 5.33 hPa at 20 degree C

Result: 4 mmHg @ 20 degrees C = 5.33 hPa
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-JUL-2002 (18)

Value: = 4.3 - 5.3 hPa at 20 degree C

23-OCT-1995 (19)

Value: = 4.3 hPa at 20 degree C

23-OCT-1995 (13)

Value: = 4.35 hPa at 20 degree C

Method: other (measured): ASTM E-1719
Year: 1998
GLP: no

10-AUG-1999 (2)

Value: = 25.5 hPa at 50 degree C

23-OCT-1995 (13)

2.5 Partition Coefficient

log Pow: = 2.38 at 25 degree C

Method: OECD Guide-line 107 "Partition Coefficient (n-octanol/water), Flask-shaking Method"

Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-JUL-2002 (20)

log Pow: = 2.36

Year: 1991
GLP: no

Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-JUL-2002 (21)

log Pow: = 1.935

Method: other (calculated)

31-JUL-2002 (22)

2.6.1 Solubility in different media

Solubility in: Water
Value: = 2 g/l at 25 degree C

Reliability: (2) valid with restrictions
standard handbook
Flag: Critical study for SIDS endpoint
31-JUL-2002 (14)

Value: ca. .2 other: weight % at 25 degree C

Reliability: (2) valid with restrictions
standard handbook
02-AUG-2002 (23)

Solubility in: Water
Value: 2 g/l at 25 degree C

02-AUG-2002 (24)

Value: = .14 vol% at 20 degree C

Method: other
Year: 1998
GLP: no

10-AUG-1999 (2)

Value: = 1.4 g/l at 20 degree C

23-OCT-1995 (13)

2.6.2 Surface Tension

2.7 Flash Point

Value: ca. 36 degree C
Type: closed cup

23-OCT-1995 (23)

Value: = 36.5 degree C
Type: closed cup

Method: other: DIN 51 755

23-OCT-1995 (13)

Value: = 39 degree C
Type: closed cup

Method: other: Tag Closed Cup ASTM D-56
Year: 1998
GLP: no

10-AUG-1999 (2)

Value: = 48 degree C
Type: open cup

Method: other: Tag Open Cup ASTM D-1310
Year: 1998
GLP: no

10-AUG-1999 (2)

2.8 Auto Flammability

Value: = 267 degree C

Method: other: DIN 51 794

23-OCT-1995 (13)

Value:

Remark: not applicable.
23-OCT-1995

2.9 Flammability

Result: highly flammable

Remark: Ignition point: 267 deg C.
Flammable limits with air (Vol%): 1.2 - 10
23-OCT-1995 (23)

2.10 Explosive Properties

Remark: Explosion limits (air): 1.1 vol.% (35 degree C)-7.8 vol.% (73.4 Grad C)
23-OCT-1995 (13)

Remark: Explosive under influence of a flame in the range of the flammable limits with air (Vol%): 1.5 - 10.
23-OCT-1995

2.11 Oxidizing Properties

Remark: No data.
23-OCT-1995

2.12 Dissociation Constant

2.13 Viscosity

2.14 Additional Remarks

Remark: Dangerous reaction: polymerization
The product is stabilzed against spontanous polymerization.
23-OCT-1995 (13)

Remark:

Viscosity (CP 25 deg C):	0.81
Specific heat (Kcal/kg deg C):	0.46
Heat of vaporization (kcal/kg):	70
Heat of polymerization (kcal/kg):	117
Heat of combustion (kcal/kg):	7600
Electric resistance (Ohm cm):	3.9 x 10 exp 9
Refractice index (20 deg C, Na):	1.4190

23-OCT-1995 (25)

3.1.1 Photodegradation

INDIRECT PHOTOLYSIS
Sensitizer: OH
Conc. of sens.: 500000 molecule/cm³
Rate constant: = .0000000000001377 cm³/(molecule * sec)
Degradation: = 50 % after 1.2 day(s)

Method: other (calculated): AOP, V 1.87

Remark: Calculation with AOP V 1.87:

SMILES : O=C(OCCCC)C=C
CHEM : 2-Propenoic acid, butyl ester
MOL FOR: C7 H12 O2
MOL WT : 128.17
---------- SUMMARY (AOP v1.90): HYDROXYL RADICALS ----------
Hydrogen Abstraction = 4.5673 E-12 cm3/molecule-sec
Reaction with N, S and -OH = 0.0000 E-12 cm3/molecule-sec
Addition to Triple Bonds = 0.0000 E-12 cm3/molecule-sec
Addition to Olefinic Bonds = 9.2050 E-12 cm3/molecule-sec
Addition to Aromatic Rings = 0.0000 E-12 cm3/molecule-sec
Addition to Fused Rings = 0.0000 E-12 cm3/molecule-sec

OVERALL OH Rate Constant = 13.7723 E-12 cm3/molecule-sec
HALF-LIFE = 1.165 Days (24-hr day; 0.5E6 OH/cm3)
HALF-LIFE = 27.959 Hrs
---------- SUMMARY (AOP v1.90): OZONE REACTION ----------
OVERALL OZONE Rate Constant = 0.175000 E-17 cm3/molecule-sec
HALF-LIFE = 6.549 Days (at 7E11 mol/cm3)

Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-MAR-2003 (26)

Type: air
INDIRECT PHOTOLYSIS
Sensitizer: OH
Conc. of sens.: 500000 molecule/cm³
Degradation: = 50 % after 12.6 hour(s)

Method: other (calculated)

Remark: Rate Constant: 3.1*10^-11 cm^3/molecule*sec
23-OCT-1995 (27) (28)

INDIRECT PHOTOLYSIS
Sensitizer: O3
Conc. of sens.: 700000000000 molecule/cm³
Rate constant: = .0000000000000000175 cm³/(molecule * sec)
Degradation: = 50 % after 6.5 day(s)

Method: other (calculated): AOP, V 1.87

18-AUG-1999 (26)

Remark: No data. No photodegradation expected due to polymerization properties.
23-OCT-1995

3.1.2 Stability in Water

Type: abiotic
t1/2 pH4: > 999.9 day(s) at 25 degree C
t1/2 pH7: > 999.9 day(s) at 25 degree C
t1/2 pH 11 **:** = 243 minute(s) at 25 degree C

Method: other
Year: 1990
GLP: yes
Test substance: as prescribed by 1.1 - 1.4

Method: 14C-Butyl acrylate was added to pH3, 7, and 11 buffer solutions at the 10 microgram/ml (ppm) level. The 14C-butyl acrylate working solution was prepared in acetonitrile. A 20 microliter aliquot of this solution added to the buffer solutions (4.7 ml) made the acetonitrile concentration <1%. Samples were maintained at 25 +/- 1 C in the dark during the study. Triplicate samples were removed for analysis at days 0, 1, 4, 7, 14, 21, and 28 for pH 3 and pH 7 and at 0, 1, 2, 3, 4, 5, 6, 8, 11, 12, and 22 hours for pH 11.
Result: The hydrolysis half-life of 14C-butyl acrylate at pH 11 was 243 minutes. There was less than 2% hydrolysis of 14C-butyl acrylate at pH 3 and pH 7 during the 28 day period. Approximate hydrolysis half-life values for pH 3 and pH 7, calculated using initial and final 14C-butyl acrylate concentrations, were 2.8e3 days at pH 3 and 1.1e3 days at pH 7.
Reliability: (1) valid without restriction
Flag: Critical study for SIDS endpoint
31-JUL-2002 (29)

Type: abiotic
t1/2 pH7: = 1.1 year at 25 degree C
t1/2 pH 8 **:** = 10.6 year at 25 degree C

Method: other: HYDROWIN, V 1.67

Remark: total Kb for PH > 8 at 25 °C: 2.071E-002 L/mol-sec
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
07-JAN-2003 (30)

Type: abiotic
t1/2 pH7: = 37 month at 25 degree C
t1/2 pH 11 **:** = 243 minute(s) at 25 degree C

Remark: pH3: t1/2 = 2800 days
31-JUL-2002 (31)

3.1.3 Stability in Soil

Method: The adsorption and desorption of n-butyl acrylate (butyl acrylate, BA) was examined on five different soils. The soils, an aquatic sandy loam sediment, a loamy sand, a clay loam and 2 loams had a pH range of 5.2 - 7.5. The organic matter ranged form 0.80% for the loamy sand to 7.9% for one

of the loams. The organic carbon content of the soils, determined from the percent of organic matter times 0.580, ranged from 0.46 to 0.58%

Result: Koc value: 88 (mean); range from 40-148
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-MAR-2003 (32)

Remark: Soil Koc 93.9 (calculated)
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
09-JAN-2004 (33)

3.2.1 Monitoring Data (Environment)

Type of measurement: other

Remark: For the Federal Republic of Germany no data available concerning the occurrence of n-butyl acrylate in surface water and/or ground water.
07-JAN-2003

Type of measurement: other

Remark: A simple finding of 0.234 mg/l butyl acrylate was detected in the eluate of soxhlet-extracted core samples taken in 1986 from a lagoon with deposited industrial sewage sludges in the USA. The core samples had been taken at a depth of 1.2 to 1.8 m. No butyl acrylate could be detected in deeper core samples at 2.4 to 4.3 m.
23-OCT-1995 (34)

3.2.2 Field Studies

3.3.1 Transport between Environmental Compartments

Type: other: calculation of the Henry's Law Constant

Remark:
n-Butylacrylate (CAS No. 141-32-2)
calculation according to different methods

1.
Henry = = Vp x MW/SOL

Vp = 727 Pa at 25 °C
MW = 128.17 g/mol
SOL = 2000 g/m³ at 25 °C

Henry's Law constant = 46.59 Pa m³ mol-1 (at 25 °C)

2. (according to HenryWin V 3.10)

SMILES : O=C(OCCCC)C=C
CHEM : 2-Propenoic acid, butyl ester
MOL FOR: C7 H12 O2
MOL WT : 128.17

Experimental Database Structure Match:
Name : BUTYL ACRYLATE

CAS Num : 000141-32-2
Exp HLC : 4.60E-04 atm-m3/mole (= 46.6 Pa m³ mol-1)
Temper : 25 deg C
Exp VP : 5.45E+00 mm Hg
Exp WSol : 2.00E+03 mg/L

BOND CONTRIBUTION DESCRIPTION

HENRYs LAW CONSTANT at 25 deg C = 2.16E-004 atm-m3/mole
= 21.88 Pa m³ mol-1

Henrys LC [VP/WSol estimate using EPI values]:
HLC: 4.596E-004 atm-m3/mole
VP: 5.45 mm Hg
WS: 2E+003 mg/L

Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-MAR-2003 (35)

Type: volatility
Media: water - air

Remark: According to Thomas n-butyl acrylate is moderate volatile from aqueous solutions.
29-JUL-2002 (36)

Type: volatility
Media: water - air

Remark: Approximately, the Henry's Law Constant Hc can be determined as the quotient of water solubility Cs (1.4 g/l=10.9 mol/m^3, 1.6 g/l=12.5 mol/m^3, respectively at 20 degree C) and the vapour pressur PS (4.3 respective 5.3 hPa at 20 degree C) according to the formula of Schamp & Van Langenhove (1986):
Hc=Ps/Cs (Pa*m^3/mol) ->
Hc=39, 42 Pa*m^3/mol, respectively.
29-JUL-2002 (37) (38)

Type: volatility
Media: water - air

Remark: Henry's Law Constant: 39 Pa*m^3/mol.
23-OCT-1995 (39)

Type: other: Henry's Law Constant

Remark: 3.5e-4 atm-m3/mol
09-JAN-2004 (29)

3.3.2 Distribution

Media: air - biota - sediment(s) - soil - water
Method: Calculation according Mackay, Level I

Remark: air: 94 %, water: 5.73 %, soil: 0.11 %, sediment: 0.11 %
Mackay Level I V2.11 Model:

Chemical properties:

molecular mass (g/mol): 128.17
Temp. (°C): 20
Log Kow: 2.38
Water Solubility (g/m3): 2000
Vapor Pressure (Pa): 727
Melting Point (°C): - 64

Phase properties and composition:

Phase	Volume (m3)	Density (kg/m3)
air	6.00E+09	1.206
water	7.00E+06	1000
soil	45000	1500
sediment	21000	1300
susp. sediment	35	1500
fish	7	1000
aerosol	0.12	1500

Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-MAR-2003 (26)

Media: air - biota - sediment(s) - soil - water
Method: other (calculation): Level III Fugacity Model

Remark: According to the US-EPA Toxic Release Inventory (TRI) report 1999 the percentage of release of n-butyl acrylate was:
total: 100 % (254461 pounds)
air: 96.3 % (245012 pounds)
water: 3.4 % (8747 pounds)
soil: 0.27 % (546 + 156 pounds)
This distribution to the different compartments were taken for the Level III Fugacity Model, to get more realistic results.

Result: Level III Fugacity Model (Full-Output):

Chem Name : 2-Propenoic acid, butyl ester
Molecular Wt: 128.17
Henry's LC : 0.00046 atm-m3/mole (Henry database)
Vapor Press : 5.05 mm Hg (Mpbpwin program)
Log Kow : 2.36 (Kowwin program)
Soil Koc : 93.9 (calc by model)

	Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)
Air	89.4	28	96.3
Water	8.24	55	3.4
Soil	2.39	170	0.3
Sediment	0.00963	170	0

Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-MAR-2003 (33)

3.4 Mode of Degradation in Actual Use

3.5 Biodegradation

Type: aerobic
Inoculum: activated sludge

Concentration: 100 mg/l related to Test substance
Degradation: = 61 % after 14 day(s)
Result: readily biodegradable

Method: OECD Guide-line 301 C "Ready Biodegradability: Modified MITI Test (I)"

Method: The test was conducted in accordance with "Biodegradation test of chemical substance by microorganisms etc." stipulated in the Order Prescribing the Items of the Test Relating to the New Chemical Substance (1974, Order of the Prime Minsiter, the Minister of Health and Welfare, the minister of International Trade and Industry). The guideline corresponds to ("301C Ready Biodegradability: Modified MITI Test (I)" stipulated in the OECD Guidelines for Testing of Chemicals (May 12th,1981)

Remark: Sludge sampling were made at 10 places in Japan (return sludge of city sewage plants, and surface water and surface soil of rivers, lakes and sea) in March, June, September and December every year.

Sludge concentration: 30 mg/l

Reference substance: Aniline

The percentage biodegradation was calculated by BOD:

$$\text{Percentage biodegradation (\%)} = \frac{\text{BOD} - \text{B}}{\text{TOD}} \times 100$$

BOD: Biochemical Oxygen Demand in (sludge + test substance)
B: Biochemical Oxygen Demand in control blank
TOD: Theoretical Oxygen Demand required when the test substance was completely oxidized.

Reliability: (1) valid without restriction
Valid without restrictions - study was performed according to OECD and MITI - Guidelines.

Flag: Critical study for SIDS endpoint

31-MAR-2003 (40)

Type: aerobic
Inoculum: other: Secondary effluent was collected on 13 March 1996 from the DRWPCC in Downingtown, Pennsylvania. The effluent was allowed to settle for one hour. The supernatant was decanted and was used as the inoculum.
Contact time: 28 day(s)

Method: OECD Guide-line 301 D "Ready Biodegradability: Closed Bottle Test"
Year: 1996
GLP: yes
Test substance: other TS: n-butylacrylate, purity 99 %

Method: TEST PROCEDURE: Biochemical Oxygen Demand (BOD) dilution water was the test medium. It consisted of deionized water containing one milliliter of the following standard reagent solutions per liter of water prepared: magnesium sulfate solution, 2.25% w/v, VWR, Cat. No. VW3328-1, Lot No. 9502168, calcium chloride solution, 2.75% w/v, VWR, Cat. No. VW3308-1, Lot No. 9411250 phosphate buffer, pH 7.2, VWR,

Cat. No. VW3345-1, Lot No. 9406169 ferric chloride solution, 0.025% w/v, VWR, Cat. No. VW3318-1, Lot No. 9503395.

Inoculum: Secondary effluent was collected on 13 March 1996 from the DRWPCC in Downingtown, Pennsylvania. The facility receives predominately domestic sewage. The effluent was allowed to settle for one hour. The supernatant was decanted and was used as the inoculum. According OECD-Guideline one drop (0.05 ml) to 5 ml of filtrate per litre of medium (no further information given).

At test initiation, approximately 150 mL of dilution water was added to each BOD bottle. The appropriate amount of each test/reference substance stock solution was added to each bottle such that the test/reference substance concentration in the BOD bottles was 3 mg active/L. The bottles were then filled completely (300 ml) with BOD dilution water. The initial Dissolved Oxygen (DO) concentration was determined in one replicate from each treatment. The bottles were discarded after the DO measurement. The remaining bottles were capped and placed in an incubator in the dark at 20 ± 0.2 degrees C.

STATISTICAL METHODS: The oxygen depletion exerted by the inoculum was subtracted from the oxygen depletion in the test/reference bottles at each time point. The BOD of each test/reference substance was calculated using the following equation:

BOD = mg 02/L uptake by test substance-mg 02/L uptake by blank divided by mg O2/mg test substance/L in vessel

The BOD was compared to the ThOD provided by the Sponsor and the percentage of degradation was calculated by:

% degradation = (BOD divided by ThOD) X 100

Result: RESULTS: Final mean percent biodegraded was calculated and determined as follows:
Butyl acrylate (BA): initial DO (9.0mg/L); mean DO day 28 (4.7 mg/L); ThOD day 28 (57.8 %). Test material is not readily biodegradable.

The reference control tested with BA was sodium benzoate with a ThOD of 95.8% (readily biodegradable).

Reliability: (1) valid without restriction
Flag: Critical study for SIDS endpoint
31-MAR-2003 (41)

Type: aerobic
Degradation: > 60 % after 15 day(s)

Method: other: BODx-determination, DEV H5 DIN 38409, Teil 51, Deutsche Einheitsverfahren zur Wasser-, Abwasser- und Schlammuntersuchung, Bestimmung des biochemischen Sauerstoffbedarfs

Remark: BASF test conditions; BOD of COD
BOD5*100/COD =38%.
29-JUL-2002 (42)

Type: aerobic

Inoculum: activated sludge
Degradation: > 30 % after 14 day(s)

Method: other: ORIGINAL-MITI-Test, Biodegradability and Bioaccumulation Test of Chemical Substances (C-5/98/JAP) 1978

Remark: 100 ppm test substance / 30 ppm sludge
BOD of THOD; substance-specific and -unspecific analysis
Substance is listed as readily biodegradable in the MITI-list.
29-JUL-2002 (43)

Type: aerobic
Inoculum: other: Inokula from river water
Degradation: = 98 - 100 % after 3 day(s)

Method: other: cultivation methode (Screeningtest)

Remark: Depending on the investigating institutes biodegradation rates of 100/100/100/98% were achieved at initial concentrations of 50/50/50/36 ppm (test substance).
readily biodegradable
Reliability: (4) not assignable
publication in Japanese, only abstract in English available
28-MAR-2003 (44)

Type: aerobic
Inoculum: other: Inokula see water
Degradation: = 39 - 100 % after 3 day(s)

Method: other: cultivation methode (Screeningtest)

Remark: Depending on the investigating institutes biodegradation rates of 100/72/39/91% were achieved at initial concentrations of 50/50/50/36 ppm (test substance).
Moderately to readily biodegradable
Reliability: (4) not assignable
publication in Japanese, only abstract in English available
28-MAR-2003 (44)

3.6 BOD5, COD or BOD5/COD Ratio

B O D 5

Method: Directive 84/449/EEC, C.8 "Biodegradation: Biochemical Oxygen Demand"
BOD5: = 920 mg/l

C O D

Method: Directive 84/449/EEC, C.9 "Biodegradation: Chemical Oxygen Demand"
Year:
COD: = 1850 mg/g substance

R A T I O B O D 5 / C O D

BOD5/COD: = .497
Method:
Result: BOD 15 = 63 %
Reliability: (2) valid with restrictions

29-JUL-2002 (45)

Method: other

C O D

Method: other: DIN 38409/43
Year:
COD: = 1874 mg/g substance

R A T I O B O D 5 / C O D

BOD5/COD: = .37
Method:
Remark: BOD5=700 mg/g.
29-JUL-2002 (42)
Method:
Year:

R A T I O B O D 5 / C O D

BOD5/COD: = .56
Method:
29-JUL-2002 (46)
Method:
Year:
Method:
Remark: No data.
23-OCT-1995

3.7 Bioaccumulation

BCF: 13.1

Method: other: calculation with BCFWIN V 2.14

Remark:

```
BCF Program (v2.14) Results:
============================
SMILES : O=C(OCCCC)C=C
CHEM   : 2-Propenoic acid, butyl ester
MOL FOR: C7 H12 O2
MOL WT : 128.17

Log Kow  (estimated)  :  2.20
Log Kow (experimental):  2.36
Log Kow used by BCF estimates:  2.36

Equation Used to Make BCF estimate:
   Log BCF = 0.77 log Kow - 0.70 + Correction

      Correction(s):                    Value
       No Applicable Correction Factors
   Estimated Log BCF =  1.117  (BCF = 13.1)
```

Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-MAR-2003 (47)

Method: other

Remark: A log Pow of 2.38 was determined experimentally by gas chromatography indicating a low potential of bioaccumulation.
29-JUL-2002 (48) (37)

Method: other

Remark: The calculated distribution coefficient of 1.67 was derived from a retention time measurement via high pressure liquid chromatography.
29-JUL-2002 (49)

Method: other

Remark: According to the MITI-list (MITI,1987) n-butyl acrylate does not bioaccumulate.
29-JUL-2002 (50)

3.8 Additional Remarks

Memo: more information see BUA-report no. 129

18-AUG-1999

Remark: In additional experiments Guisti et al. were able to decrease the amount of n-butyl acrylate in aqueous solutions by adsorption to activated charcoal from 1000 to 43 mg/l (95.9%).
29-JUL-2002 (51)

AQUATIC ORGANISMS

4.1 Acute/Prolonged Toxicity to Fish

Type: flow through
Species: Cyprinodon variegatus (Fish, estuary, marine)
Exposure period: 96 hour(s)
Unit: mg/l **Analytical monitoring:** yes
NOEC: < 1.3
LC0: = 1.3
LC50: = 2.1
LC100: = 3.5

Method: OECD Guide-line 203 "Fish, Acute Toxicity Test"
Year: 1996
GLP: yes
Test substance: as prescribed by 1.1 - 1.4

Method: TEST DETAILS: One stock solution was prepared for each of the five concentrations tested. Butyl acrylate was dissolved in acetone at concentrations of 11.7, 19.4, 32.4, 54.0 and 90.0 mg butyl acrylate/mL.

Sheepshead minnows used in the test were obtained as juveniles from cultures maintained by Wildlife International Ltd., Easton, Maryland. Sheepshead minnows were cultured in water from the same source as used during the test. The juvenile fish were held for at least 14 days prior to testing and were acclimated to test conditions for approximately 75 hours prior to test initiation. During the holding and acclimation periods the fish showed no signs of disease or stress. During the 14?day holding period preceding the test, water temperatures ranged from 22.5 to 23.5 degrees C. The pH of the water ranged from 7.8 to 7.9, salinity ranged from 20 to 22% (parts per thousand) and dissolved oxygen ranged from 6.0 to 7.8 mg/L.

The sheepshead minnows were fed flaked fish food supplied by Zeigler Brothers, Inc., Gardners, PA and live brine shrimp nauplil (Atlemia sp.) supplied by Bonneville Artemia International Inc., Salt Lake City, UT, during holding. The fish were not fed during the 75 hour acclimation period or during the test.

All fish used in the test were from the same source and year class, and the standard length of the longest fish was no more than twice the length of the shortest. The average standard length of 10 negative control fish measured at the end of the test was 19 mm with a range of 17 to 23 mm. The average weight of 10 negative control fish at the end of the test was 0.18 grams with a range of 0.10 to 0.35 grams. Loading was defined as the total wet weight of fish per liter of test water that passed through the test chamber in 24 hours, and was determined to be 0.02 g fish/L. Instantaneous loading was 0.12 g fish/L of test water present in the test chambers at any given time.

A continuous flow diluter was used to deliver each concentration of the test substance and negative (saltwater) control. Syringe pumps (Harvard Apparatus, South Natick,

Massachusetts) were used to deliver the five test substance stocks and the solvent for the solvent control into mixing chambers assigned to each treatment group. The stocks were diluted with saltwater in the mixing chambers in order to obtain the desired test concentrations. The flow of dilution water to the mixing chambers was controlled by rotameters. The flow of test water from each mixing chamber was split and allowed to flow into replicate test chambers. The proportion of test water that was split into each replicate was checked prior to the test to ensure that flow rates varied by no more than ±10% of the mean for the two replicates.

The diluter was adjusted so that each test chamber received approximately six volume additions of test water every 24 hours. The delivery pumps were calibrated before the test, and the general operation of the diluter was checked visually at least two times per day during the test and at least once at the end of the test.

Test chambers were Teflon (25 L) polyethylene aquaria filled with approximately 15 L of test water. The depth of the test water in a representative chamber was approximately 18 cm. The test chambers were impartially positioned in a temperature controlled water bath designed to maintain a temperature of 22±2 degrees C.

The water used for culturing and testing was natural seawater collected at Indian River, Inlet, Delaware, and diluted to a salinity of approximately 20% with well water.
pH: 8 - 8.2
salinity: 20

The freshly collected seawater was passed through a sand filter to remove particles greater than approximately 25 um, and pumped into a 37,800 L storage tank. The filtered seawater then was diluted with fresh water from a well on the Wildlife International Ltd. site and aerated with spray nozzles. Prior to use, the water again was filtered to remove microorganisms and particles.

Fluorescent tubes that emitted wavelengths similar to natural sunlight provided lighting used to illuminate the cultures and test chambers during culturing and testing. A photoperiod of 16 hours of light and 8 hours of darkness was controlled with an automatic timer. A 30 minute transition period of low light intensity was provided when lights went on and off to avoid sudden changes in lighting. Light intensity measured prior to the test was approximately 477 lux at the surface of the water. Light intensity measured at test termination was approximately 460 lux.

Temperature was measured in each test chamber at the beginning and end of the test using a hand?held thermometer. Temperature also was measured continuously in one negative control replicate using a Fulscope ER/C Recorder. The target test temperature' during the study was 22+2 degrees C. Dissolved oxygen, pH and salinity measurements were made on water samples collected from each replicate test chamber at test initiation, at approximately 48 hours and at test termination. Dissolved oxygen, pH, temperature and salinity

were also measured in any treatment group when 100% mortality was observed.

All organisms were observed to evaluate the number of mortalities and the number of individuals exhibiting clinical signs of toxicity or abnormal behavior. Observations were made approximately 4, 24, 48, 72, and 96 hours after test initiation. Signs of mortality and other signs of toxicity were made daily. Sheepshead minnows in the negative control, solvent control 1.2 (nominal) and 1.9 (nominal) mg butyl acrylate/L treatment groups appeared normal and healthy during the test. After 96 hours of exposure, mortality was 0, 100 and 100% in the 1.3, 3.5 and 5.1 mg butyl acrylate/L treatment groups, respectively. Although no mortality was observed in the 1.3 mg butyl acrylate/L treatment group, the majority of the fish were exhibiting clinical signs of toxicity at test termination (e.g., lethargy, erratic swimming and surfacing). The 24, 48, 72 and 96 hour concentration response curves could not be plotted because there were less than two groups in which the incidence of mortality was between 0 and 100%.

STATISTICAL METHODS: The data were analyzed using the computer program of C.E. Stephan. The program was designed to calculate the LC50 value and the 95% confidence interval by probit analysis, the moving average method, or binomial probability with nonlinear interpolation. The NOEC was determined by inspection of the mortality and clinical observation data.

Result: RESULT: The 96-hour LC50 for sheepshead minnows exposed to butyl acrylate was 2.1 mg butyl acrylate/L. The 95% confidence limits were 1.3 and 3.5 mg butyl acrylate/L. Due to the clinical signs of toxicity observed in the 1.3 mg butyl acrylate/L treatment group, the NOEC was considered to be <1.3 mg butyl acrylate/L.

Test substance: TEST MATERIAL:
Test substance (n-butyl acrylate) characterization provided by the Sponsor indicated a lot number of F4284-01-GB and a purity of 99.9% active ingredient. The test substance was stored at ambient room temperature.

Reliability: (2) valid with restrictions
DATA QUALITY: Study was conducted in accordance with a recognized scientific method for determining acute toxicity to fish, OECD Guideline 203, Fish Acute Toxicity Test; and ASTM Standard E729-88a, Standard Guide for Conducting Acute Toxicity Tests with Fishes, Macroinvertebrates and Amphibians. The study provides sufficient information to support the conclusion.

Flag: Critical study for SIDS endpoint

31-MAR-2003 (52)

Type: flow through
Species: Salmo gairdneri (Fish, estuary, fresh water)
Exposure period: 96 hour(s)
Unit: mg/l **Analytical monitoring:** yes
NOEC: = 3.8
LC0: = 3.8
LC50: = 5.2
LC100: = 7.2

Method: OECD Guide-line 203 "Fish, Acute Toxicity Test"

Year: 1990
GLP: yes
Test substance: as prescribed by 1.1 - 1.4

Method: TEST MATERIAL: The n-Butyl Acrylate (Lot No. 5-0876-88, CAS No. 141-32-2) was received frozen from Rohm and Haas Company on January 20, 1989 and was stored at room temperature. The compound was contained in a one quart clear glass jar and was observed to be a clear liquid. Compound purity was given as 99.72%. The compound was assigned ABC reference number TS-3044.

RECOGNIZED METHOD: The test was carried out in accordance with EEC method, part C and OECD Test Guideline 203.

TEST DETAILS:
The 140 test fish (lot # 189) used in this study were obtained from Mt. Lassen Trout Farms in Red Bluff, California. The fish were reared and maintained at ABC Laboratories in well water and were fed newly hatched brine shrimp or a commercially available fish food daily. The laboratory environment was maintained on a 16 hour daylight photoperiod.

Seventy two hours before the initiation of the test, rainbow trout were removed from the culture tank and placed in the temperature acclimation unit. During this time, the fish were held without food. At test initiation, rainbow trout were impartially distributed to the testing unit. This was achieved by sequentially placing one to two rainbow trout into each test chamber until all chambers contained their complement of test fish. The rainbow trout used as the control group during this study had a mean weight of 1.0 (+/- 0.21) g and a mean length of 42 (+/-3.0) mm when measured at the end of the test. The biomass loading during the study was 0.10 g/l/day.

Chemical characterization of the water used in the aquatic test:
hardness: 43-44 mg/l (as CaCO3)
alkalinity: 56-57 mg/l (as CaCO3)
pH: 7.5 - 7.9
conductivity: 102-115 µMhos/cm
total organic carbon: < 1 mg/l
suspended solids: 0.4 mg/l

A proportional diluter system described by Mount and Brungs and a Hamilton Model 420 syringe dispenser were used for the intermittent introduction of n-Butyl Acrylate test solutions and/or diluent water into each test chamber. Six concentrations of the test material and a dilution water control comprised the test design. Each concentration and control was replicated twice with ten fish per test chamber.

The diluter delivered 0.5 liter of test solution or control water to each replicate test vessel at an average rate of 8.4 times per hour over the course of the study. This resulted in a flow rate of 10 1 liters of water flowing through the 15 liter replicate aquaria per day, thus giving an aquarium flow rate of 6.7 tank volumes per day. The test aquaria were immersed in a circulating water bath that was

thermostatically held at 12 +/-1 degrees C.

Diluter stock solutions of n-Butyl Acrylate were prepared in deionized water to a concentration of 1300 mg/l. The stock injector volume was adjusted to deliver 10 ml of diluter stock to the 1.85 liters in the mixing cell and to the 0.96 liter in the solvent control cell of the diluter system. The mixing cell was used by the diluter to prepare the 7.0, 3.5, 1.75, 0.875 and 0.438 mg/l solutions, while the solvent control cell was used to prepare the 14 mg/l, level six, test solution.

Static 96 hour range finding tests were conducted to determine a concentration range of n-Butyl Acrylate to use in the definitive test. The first preliminary test was conducted with nominal concentrations of 1, 10 and 100 mg/l and the second test was conducted at 5 mg/l. The 10 and 100 mg/l solutions were lethal to the rainbow trout, while the 1 and 5 mg/l solutions elicited some abnormal effects but no mortality over 96 hours of exposure.

The definitive flow through test was run using six concentration exposures of: 0.438, 0.875, 1.75, 3.5, 7.0 and 14 mg/l. Analytical mesurements of n-Butyl Acrylate were made at 0- and 96-hours. The measured concentrations averaged 0.49, 0.93, 1.9, 3.8 and 7.2 mg/l, respectively. Overall, these measured values represented 108 +/- 3.7 % of the nominal concentration. The 14 mg/l test solution was not measured.

The definitive test was initiated after the test solutions had been flowing through the aquaria for approximately 22 hours. Ten rainbow trout were impartially distributed to each replicate test chamber. Observations for mortality and sublethal responses were made once every 24 hours during the 96 hour test period. Dead individuals were removed at each observation period.

All n-Butyl Acrylate samples and standards were analyzed by spectrophotometry using a Perkin-Elmer Lambda 3B UV/VIS Spectrophotometer.

The operating parameters were as follows:
Light Source: Ultraviolet
Wavelength: 200 nm
Mode: Absorbance
Cell Path: 1 cm

STATISTICAL METHODS: Statistical analysis of the concentration vs. effect data (generally mortality) was obtained by employing a computerized LC50 program developed by Stephan et al.. This program calculated the LC50, and its 95% confidence limits by using the binomial, moving average and probit tests. Three different methods of analyzing the data were used since no one method of analysis is appropriate for all possible sets of data that may be obtained. However, if no mortality occurred, or if a dose response could not be demonstrated over a reasonable range (<37 to >63%), an LC50 and/or its 95% confidence limits can not be calculated.

Result: RESULT: The 24, 48, 72 and 96-hour LC50 values were >7.2,

>7.2, 6.6 and 5.2 mg/l, respectively, based on the average measured concentrations at 0 and 96 hours.

Behavioral/sublethal effects noted during the study included surfacing, labored respiration, quiescence, on-bottom orientation and loss of equilibrium. A no-effect concentration (NOEC) of n-Butyl Acrylate toxicity to rainbow trout was determined to be 3.8 mg/l, based upon behavioral and sublethal effects at 14 and 7.2 mg/l. The lack of mortality or behavioral/sublethal effects at the test concentrations of 3.8, 1.9, 0.93 and 0.49 mg/l supported this conclusion.

Reliability: (1) valid without restriction

DATA QUALITY: Study was conducted in accordance with a recognized scientific method for determining acute toxicity to fish, and test was similar to the OECD Guideline 203, Fish Acute Toxicity Test; and ASTM Standard E729-88a, Standard Guide For Conducting Acute Toxicity Tests with Fishes, Macroinvertebrates and Amphibians. The study provides sufficient information to support the conclusion.

Flag: Critical study for SIDS endpoint

31-JUL-2002 (53)

Type: flow through
Species: Pimephales promelas (Fish, fresh water)
Exposure period: 96 hour(s)
Unit: mg/l **Analytical monitoring:** yes
LC50: = 2.09

Method: other: according to American Society for Testing and Materials (ASTM, 1980)
GLP: no data
Test substance: other TS: iso-butyl acrylate, purity > 97 %; inhibitor was removed prior to testing.

Remark: two tests were performed
Result: Clinical signs: hyperactivity, overreactivity to outside
Test condition: Juvenile fathead minnows, ranging in age from 28 to 34 days, with an average wet weight and standard length of 0.134 +/- 0.034 g and 20.9 +/- 2.0 mm, respectively. Photoperiod: 16 h light, 8 h dark.

Continuous-flow modified Benoit mini-diluter system (Benoit, 1982).

Lake Superior water, filtered through a sand/gravel filter, was used as dilution water throughout the exposures. The lake water entered the diluter through a headbox where it was aerated and heated. Dissolved oxygen, pH and temperature were measured each day of the 4-d exposure. The average pH, temperature and dissolved oxygen concentrations were 7.62 +/-0.12, 24.6 +/- 0.4 °C and 6.71 +/- 0.67 mg/L, respectively. Alkalinity and hardness were determined from water sampled from control chambers as well as from chambers of the low, middle and high concentrations. Average alkalinity and hardness were 47.0 +/- 3.2 and 45.3 +/- 1.0 mg/L as $CaCO_3$, respectively. Water chemistry methods were those recommended by the American Public Health Association (APHA et al., 1980).

Chemical stock solutions were prepared and renewed daily.

Analytical method: capillary gas chromatography

LC50s were calculated using the average tank concentrations and a computerized Trimmed Spearman-Karber Method (Hamilton et al., 1977).

During exposures, fish were observed daily at 8, 24, 48, 72 and 96 hours. Abnormal behavioral and morphological changes were recorded using a checklist.

Data were evaluated using discriminant function analysis.

Reliability: (2) valid with restrictions
Only summary results given. No data on concentrations tested and number of fish per concentration.

Flag: Critical study for SIDS endpoint

31-MAR-2003 (54) (55)

Type: static
Species: Leuciscus idus (Fish, fresh water)
Exposure period: 96 hour(s)
Unit: mg/l **Analytical monitoring:** no
NOEC: = 4.64
LC0: = 10
LC50: ca. 22
LC100: = 46.4

Method: other: DIN 38 412 (1988)
GLP: no
Test substance: other TS: iso-butyl acrylate

Result: LC50 after
1 hour: > 100 mg/L (1% significance level)
4 hours: > 100 mg/L (1% significance level)
24 hours: 22 - 46 mg/L
48 hours: ca. 22 mg/L
72 hours: ca. 22 mg/L
96 hours: ca. 22 mg/L

Symptoms: apathy and gasping at concentrations of 10 mg/L and above. At 100 mg/L narcotic-like state.

No significant changes in pH values and oxygen content were detected during the experiment.

The results for the positive control were in the expected range.

Test condition: Concentrations tested: 10.0, 21.5, 46.4, 100 mg/L (this selection was based on the results of a range finding study which resulted in a LC50 after 96 hours of between 10 and 100 mg/L). Since no NOEC had been achieved at 10 mg/L the concentrations 2.15 and 4.64 mg/L were added 2 weeks later.

Preparation of the test substance: the substance was added to the test water without any pretreatment; subsequently the fish were placed into the aquaria.

Test animals:
body length between 4.3 and 6.0 cm, body weight between 0.7 and 2.1 g, corpulence factor 0.9.

photoperiod: 16 hours light and 8 hours darkness.
Slight aeration.

test water: reconstituted freshwater according to DIN 38412 (total hardness about 2.5 mmol/L, acid capacity about 0.8 mmol/L, pH: about 8.0, temperature 19-20 °C)

Adaptation to test water and temperature: 3 days

test vessels: glass aquarium with a stainless steel frame (30 cm x 22 cm x 24 cm), 1.3 g Fish / L test water, volume of water: 10 liters)

no. of animals per test concentration: 10

food was withdrawn 1 day before and during exposure.

Determination of mortality and symptoms: at 1, 4, 24, 48, 72, 96 hours.

Positive control: chloroacetamide

Statistical analysis: probit analysis (Finney, 1971).

Reliability: (2) valid with restrictions
Meets generally accepted scientific standards, with
Flag: Critical study for SIDS endpoint
31-MAR-2003 (56)

Type: other: SAR
Species: other: fish
Exposure period: 96 hour(s)
Unit: mg/l **Analytical monitoring:**
LC50: 1.786

Test substance: other TS: n-butyl acrylate

Remark: ECOSAR Program (v0.99g) Results
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
16-JAN-2004 (57)

Type: other: SAR
Species: other: fish
Exposure period: 96 hour(s)
Unit: mg/l **Analytical monitoring:**
LC50: 1.838

Test substance: other TS: iso-butyl acrylate

Remark: ECOSAR Program (v0.99g) Results
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
16-JAN-2004 (57)

Type: other: no data
Species: Carassius auratus (Fish, fresh water)
Exposure period: 72 hour(s)
Unit: mg/l **Analytical monitoring:** no data
LC50: = 5

31-MAR-2003 (58)

Type: other: no data
Species: Idus idus (Fish, fresh water)
Unit: mg/l **Analytical monitoring:**
LC0: = 9
LC50: = 23
LC100: = 45

23-OCT-1995 (59)

Type: static
Species: Pimephales promelas (Fish, fresh water)
Exposure period: 96 hour(s)
Unit: mg/l **Analytical monitoring:**
NOEC: = 10
LC50: = 10 - 20

Test condition: dechlorinated Lake Huron water. Test concentrations were prepared by adding varying amounts of a stock solution to a test series.
Reliability: (4) not assignable
short summary report

09-JAN-2004 (60)

Species: Carassius auratus (Fish, fresh water)
Exposure period: 72 hour(s)
Unit: mg/l **Analytical monitoring:**
LC50: = 5

31-MAR-2003 (61)

Species: Leuciscus idus (Fish, fresh water)
Exposure period: 48 hour(s)
Unit: mg/l **Analytical monitoring:**
LC50: = 23

31-MAR-2003 (62)

4.2 Acute Toxicity to Aquatic Invertebrates

Type: flow through
Species: Daphnia magna (Crustacea)
Exposure period: 48 hour(s)
Unit: mg/l **Analytical monitoring:** yes
NOEC: = 2.4
EC0: = 2.4
EC50: = 8.2
EC100: = 17
EC10 : = 4.6

Method: OECD Guide-line 202
Year: 1990
GLP: yes
Test substance: as prescribed by 1.1 - 1.4

Method: TEST ORGANISM: Test specimens of Daphnia magna were obtained from an in-house daphnid culture which has been maintained by ABC since 1977. The primary culture was obtained from the

Columbia National Fisheries Research Laboratory (CNFRL), Columbia, Missouri, in 1977. A trace of the daphnid strain indicated that CNFRL acquired their culture from the U.S. Fish and Wildlife Service Fish Control Laboratory, LaCrosse, Wisconsin, in 1960 and they obtained their culture from Pennsylvania State University in 1954.

All daphnids were held in a temperature controlled area at 20 (±2.0) degrees C. The lighting was 50-70 footcandles on a 16-hour daylight photoperiod, with 30 minute dawn and dusk transition periods. During the holding period, the daphnids were fed a suspension of algae (Selenastrum -capricornutum) supplemented with Tetramin/cereal leaves/yeast suspension. Only first-instar daphnids (<24 hours old) were selected for testing.

Chemical characterization of the water used in the aquatic test:
hardness: 168-178 mg/l (as CaCO3)
alkalinity: 192-208 mg/l (as CaCO3)
pH: 7.5 - 7.6
conductivity: 320-355 µMhos/cm
total organic carbon: < 1 mg/l
suspended solids: 0.5 mg/l
un-ionized ammonia: < 0.00262 mg/l
chlorine (TRC): < 0.05 mg/l

TEST PROCEDURE: A static, 48-hour range-finding test was conducted. The test concentrations for this preliminary test were set at 0.1, 1.0, 10 and 100 mg/l. After 24-hours all daphnids were immobilized in the 100 mg/l test concentration. In the 10 mg/l test concentration, 4 daphnids out of 5 were immobilized at 48-hours. All other test concentrations appeared to be unaffected. The temperature ranged from 20-21 degrees C during the range-finding test. Based on the results of preliminary testing and discussions with the study sponsor, five concentrations of the test compound were estimated for the definitive study and were as follows: 1.2, 2.4, 5.0, 10 and 20 mg/l.

The definitive test was initiated by random assignment of 10 first-instar Daphnia magna (ABC Lot Numbers 89-C4 and 89-F5) to each of the four replicate test chambers; i.e. 40 daphnids were used per concentration. This represents a loading factor of 1 daphnid per 100 ml of solution. All concentrations were observed at 4, 24 and 48-hours for immobilization and other abnormal effects such as surfacing, erratic movement and/or daphnids laying on the bottom.

A primary stock standard of Butyl Acrylate was prepared at a concentration of 2.04 mg/ml in Millipore water and stored at room temperature. Subsequent dilutions were prepared in Millipore water for use as spiking solutions and in test dilution water for spectrophotometry standards. All standard preparations and dilutions were recorded.

ANALYTICAL MONITORING: Yes. Water quality parameters of temperature, dissolved oxygen and pH were measured in each test concentration at 0 and 48 hours of testing. Dissolved oxygen levels were measured with a YSI model 54 dissolved oxygen meter and probe, while the pH values were measured

with a Corning model 140 pH/mV meter and Beckman 39831 electrode. Light intensity was measured with a LI-COR Model LI-185B light meter. The temperature in the water bath was recorded continuously with a Rustrak Rangerm Data Logger.

All Butyl Acrylate samples and standards were analyzed by spectrophotometry using a Perkin-Elmer Lambda 3B UV/VIS Spectrophotometer. The operating parameters were as follows:

Light Source: Ultraviolet
Wavelength: 200 nm
Mode: Absorbance
Cell Path: 1 cm

STATISTICAL ANALYSIS: Statistical analysis of the concentration vs. effect data (immobility) was obtained by employing a computerized LC50 (EC 50) program developed by Stephan et al. This program calculated the EC., statistic and its 95% confidence limits using the binomial, the moving average, and the probit tests, if data permitted. Three different methods of analyzing the data were used since no one method of analysis is appropriate for all possible sets of data that may be obtained. The method of calculation selected for presentation in this report was that which gave the narrowest confidence limits for the EC50 (7, 8) although all three models are valid. However, if no immobility occurred or if a dose response could not be demonstrated over a reasonable range (<37 to >63%) and EC50 and/or its 95% confidence limits could not be calculated.

The 48-hour dose-response slope was determined by transferring percent mortality to probit values. Transformation to probit values allows calculation of a straight line. After transformation to probit values a linear regression was calculated to achieve a 48-hour dose-response slope.

Result: RESULTS: The 4-hour, 24-hour and 48-hour EC50 values for Butyl Acrylate based on immobilization were >17, >17, and 8.2 mg/, respectively. The 48-hour dose response slope was calculated to be 6.1. All results were based on the mean measured concentrations of: 1.4, 2.4, 4.6, 8.9 and 17 mg/l. The no observed effect concentration (NOEL) based on the lack of immobilization or other abnormal effects after 48-hours was 2.4 mg/l.

Reliability: (1) valid without restriction
DATA QUALITY: Study was conducted in accordance with a recognized scientific procedure. The study results appear reasonable and provide sufficient information to support the conclusion.

Flag: Critical study for SIDS endpoint

31-MAR-2003 (63)

Type: static
Species: Daphnia magna (Crustacea)
Exposure period: 48 hour(s)
Unit: mg/l **Analytical monitoring:** no
EC0: = 12.5
EC50: = 19.8
EC100: = 50

Method: other: Directive 79/831/EEC, annex 5, C
Year: 1991
GLP: no
Test substance: other TS: iso-butyl acrylate, purity > 99 %

Remark: EC values relate to nominal concentrations.
Result: EC 50 (48 hrs), 95% confidence limits: 16.4 - 24.0 mg/L.

EC 50 (3h, 6h): > 100 mg/L.
EC 50 (24 h): 36.7 (32.7 - 41.1) mg/L.

EC 0 (3h, 6h): 100 mg/L.
EC 0 (24 h): 25 mg/L.

EC 100 (3h, 6h): > 100 mg/L.
EC 100 (24h): 100 mg/L.

No significant changes in pH values and oxygen levels were recorded during the study period.
Test condition: water temperature: 20 +/- 1 °C, hardness 2.2 - 3.2 mmol/L, Ca/Mg ratio 4:1, pH 7.5 - 8.5, oxygen > 2 mg/L, conductivity 699 uS/cm.
light dark cycle: 16 h light, 8 h dark.
test volume: 10 mL.
age of animals: 2-24 hours.
5 animals / test vessel; 2 mL / animal.
20 animals / concentration.
concentrations: 3.13, 6.25, 12.5, 25, 50, 100 mg/L.
no of replicates: 4
immobilization of test animals was recorded at 0, 3, 6, 24 and 48 hours.
determination of EC50 values: probit analysis (Finney) or moving average method.
The test was performed in 20 ml open test tubes.
Reliability: (2) valid with restrictions
Meets generally accepted scientific standards, with acceptable restrictions.
Flag: Critical study for SIDS endpoint
31-MAR-2003 (64)

Type: static
Species: Daphnia magna (Crustacea)
Exposure period: 48 hour(s)
Unit: mg/l **Analytical monitoring:** no
EC0: = 3.13
EC50: = 9.7
EC100: = 25

Method: other: Directive 79/831/EEC, annex V, C
Year: 1988
GLP: no
Test substance: other TS: iso-butyl acrylate

Remark: EC values relate to nominal concentrations.
Result: EC 50, 95% confidence limits: 5.69 - 13.71 mg/L.

EC 50 (3h, 6h): > 50 mg/L.
EC 50 (24 h): -

EC 0 (3h): 50 mg/L.

EC 0 (6h): 25 mg/L.
EC 0 (24 h): 12.5 mg/L.

EC 100 (3h, 6h, 24h): > 50 mg/L.

No significant changes in pH values and oxygen levels were recorded during the study period.

Test condition: water temperature: 20 +/- 1 °C, hardness 2.37 mmol/L, Ca/Mg ratio 4:1, Na/K ratio 10:1, pH 8.8, oxygen > 2 mg/L, conductivity 600 uS/cm.
light dark cycle: 16 h light, 8 h dark.
test volume: 10 mL.
age of animals: 2-24 hours.
5 animals / test vessel; 2 mL / animal.
20 animals / concentration.
concentrations: 0.4, 0.8, 1.6, 3.13, 6.25, 12.5, 25, 50 mg/L.
no of replicates: 4
immobilization of test animals was recorded at 0, 3, 6, 24 and 48 hours.
determination of EC50 values: moving average method.
The test was performed in 20 ml open test tubes.

Reliability: (2) valid with restrictions
Meets generally accepted scientific standards, with acceptable restrictions.

Flag: Critical study for SIDS endpoint

31-MAR-2003 (65)

Species: Daphnia magna (Crustacea)
Exposure period: 24 hour(s)
Unit: mg/l **Analytical monitoring:**
EC0: = 16
EC50: = 230
EC100: = 500

Method: other: Immobilisation Test

31-MAR-2003 (66)

Species: other aquatic arthropod: Daphnia magna Straus
Exposure period: 24 hour(s)
Unit: mg/l **Analytical monitoring:**
EC0: = 7.8
EC50: = 42
EC100: = 125

Method: other: according to DIN 38412 part 11

31-MAR-2003 (67)

Type: other: SAR
Species: other: daphnid
Exposure period: 48 hour(s)
Unit: mg/l **Analytical monitoring:**
EC50: 9.81

Test substance: other TS: n-butyl acrylate

Remark: ECOSAR Program (v0.99g) Results
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint

16-JAN-2004 (57)

Type: other: SAR
Species: other: daphnid
Exposure period: 48 hour(s)
Unit: mg/l **Analytical monitoring:**
EC50: 10.653

Test substance: other TS: iso-butyl acrylate

Remark: ECOSAR Program (v0.99g) Results
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
16-JAN-2004 (57)

4.3 Toxicity to Aquatic Plants e.g. Algae

Species: Selenastrum capricornutum (Algae)
Endpoint: growth rate
Exposure period: 96 hour(s)
Unit: mg/l **Analytical monitoring:** yes
NOEC: < 3.8
LOEC: < 3.8
EC10: < 3.8
EC50: = 5.2
EC50 arith. means 2.65

Method: other: OECD Guide-line 201 (Algae, Growth Inhibition Test), results given as nominal concentration
Year: 1990
GLP: yes
Test substance: as prescribed by 1.1 - 1.4

Method: TEST ORGANISM: The parent stock of Selenastrum capricornutum (Supplier Batch #1648,
ABC culture #H16) used in the definitive test was obtained from The Department of Botany, Culture Collection of Algae, The University of Texas at Austin, Texas 78713-7640 on October 4, 1988.

The algae culture was identified as Selenastrum capricornutum on the culture tube label. The parent culture was divided into individual lots by adding single scrapings from the algae/agar surface to sterile culture tubes. Each tube contained 10 ml of sterile synthetic algae culture medium. The prepared lots were stored at 7 degrees C in a refrigerator until used to initiate new stock cultures. Periodically new Selenastrum capricornutum cultures were initiated using a lot of this parent stock (or cloned from an existing culture derived from the parent stock) in 100 ml of sterile culture medium. Cultures of Selenastrum Capricornutum at Analytical Bio-Chemistry Laboratories were maintained under environmental test conditions outlined below. The algal culture used for this toxicity test was prepared from the washed cells used to inoculate a previous study. On March 15,1989 the remaining washed cells (~70 ml) were brought to 100 ml volume with algae nutrient. This culture was then used to inoculate the definitive study with n-Butyl Acrylate.

TEST PROCEDURE: The algal toxicity study was conducted in 250 ml Erlenmeyer flasks containing 100 ml of synthetic algae culture medium. This medium was composed of 1.0 ml of each of the following nutrient solutions diluted to a final volume of 1000 ml of autoclaved reverse osmosis water.

Macronutrient Stock Solutions each in 1000 ml:
NaNO 3 25.500 g
NaHCO 3 15.000 g
MgSO4* 7H 2 0 14.700 g
MgC12 6H 2 0 12.164 g
CaCl2* 2H 2 0 4.410 g
K2HPO 4 1.044 g

Micronutrients Stock Solution:
MnCl2 4H 2 0 415.4 mg
Na 2 EDTA 2H 2 0 300.0 mg
H 3 BO 3 185.5 mg
FeCl36H 2 0 159.8 mg
NaMoO 4* 2H 2 0 7.3 mg
ZnCl 2 3.3 mg
Cocl 2* 6H 2 0 1.4 mg
CuCl2 2H 2 0 12.0 pg

Each test flask received 1.0 ml of algal inoculum containing approximately 1.0 X 10E6 cells/ml resulting in approximately 1.0 X 10E4 cells/ml for each flask. Initial cell counts of control flasks resulted in an actual mean cell count of 8.5 X 10E3 cells/ml. The algal cell counts were accomplished utilizing a hemacytometer and an Olympus Model CHA microscope.

A 96 hour range finding study was conducted to determine the concentration range for the definitive study. Test concentrations for this study were set at 0.10, 1.0, 10 and 100 mg/l. Algal cell counts for these concentrations were 110, 102, 71 and 1.2%, respectively of the control population. Based on these results, five nominal concentrations of the test compound ranging from 3.8 to 60 mg/l were selected for the definitive algal assay. Test flasks were prepared in triplicate for each test concentration and the control. All test flasks were labeled with a felt marker as to compound code, concentration, replicate and grid position (from a random assignment program). Each flask was stoppered with a foam plug.

Following preparation, the test vessels were positioned in a random fashion and incubated for 96 hours at 24 (±1) degrees C under continuous "cool white" fluorescent light and constant shaking. Light intensity was maintained at 400 ±10% ft-c (approximately 4300 LUX) and the agitation rate was 100 rpm. Temperature and light intensity were monitored throughout the study.

ANALYTICAL MONITORING: Yes. The measured concentrations of n-Butyl Acrylate in test media were determined at 0 and 96 hours of the toxicity test. Control and n-Butyl Acrylate fortified samples were also determined at each sample period. Concentrations of n?Butyl Acrylate at 0 and 96 hours were measured through the use of spectrophotometry.

The analysis of the test media samples for n-Butyl Acrylate during the algae toxicity test was accomplished based on a method developed by ABC Laboratories. This method was validated for the recovery of n-Butyl Acrylate in aquatic test water prior to the initiation of the algae toxicity test. The results of the method validation were presented to Methacrylate Producers Association as ABC report #37338.

Preparation of the test media samples for the determination of n-Butyl Acrylate during the 96 hour algae toxicity test was performed in the following manner:

All samples and standards were analyzed by spectrophotometry using a Perkin Elmer Lambda 3B UV/VIS Spectrophotometer. The settings were as follows:

Light Source: Ultraviolet
Wavelength:200 nm
Mode: Absorbance
Cell Path: 1 cm

The spectrophotometer was calibrated and blanked using a I cm light patch (quartz) cell filled with control test media.

STATISTICAL ANALYSIS: Cell counts for each concentration and control were subjected to analysis of variance (ANOVA) and treatment means were compared using a multiple means test (Dunnett's). Differences were considered significant at $P<0.05$. Cell counts for each replicate were first transformed using the square root of the cell count.

For each set of data (cell count) where a significant difference was identified, two regression models were analyzed by SYSTATS:

(1) quadratic model of P vs. concentration

P = a + b1 (conc.) + b 2 (conc.)2

(2) quadratic model of P vs. ln concentration

P = a + b1 (1n conc.) + b 2 (1n conc.)2

where p = response (cell count)
a = y-intercept
b1 = linear effect coefficient
b 2 = curvature effect coefficient

The best quadratic regression model (greatest multiple "R" value) was then chosen for use in subsequent Lotus 123 calculations.

EC 50 values were estimated using the model set up with LOTUS 123. The independent variable was the concentration of the test chemical, and the dependent variable was defined as:

Pi = 100(C - Ti)/C

where

Pi = % difference from control for treatment replicate i

Ti = the measured cell density for treatment replicate i

C = the mean control measured for cell density

The EC 50 value was estimated by substituting Pi = 50 and solving for concentration.

Remark: Analytical concentrations:

Time 0 hr	Time 96 hr	arythmetic means	nominal conc.
3.5 mg/l	< 0.1 mg/l	1.8 mg/l	3.8 mg/l
7.2 mg/l	< 0.1 mg/l	3.15 mg/l	7.5 mg/l
15 mg/l	< 0.1 mg/l	7.55 mg/l	15 mg/l
32 mg/l	< 0.1 mg/l	16.5 mg/l	30 mg/l
67 mg/l	< 0.1 mg/l	34 mg/l	60 mg/l

The calculated 96 hr-EC50 was 5.2 mg/l (nominal), taking the arythmetic means this would be 2.65 mg/l.
This is in the same range like the Model EPIWIN/ECOSAR which gives a 96 hr EC50 for green algae of 1.023 mg/l.

The structural related iso-butyl acrylate was tested in closed systems, the measured 72 hr-EC50 Desmodesmus subspicatus was 3.18 mg/l(biomass) and 5.28 mg/l (growth), respectively.

Result: RESULTS: A 96-Hour static acute algae study with n-Butyl Acrylate was successfully completed on March 20, 1989. The five nominal concentrations of n-Butyl Acrylate which ranged from 3.8 to 60 mg/l were selected from the results of a range-finding test.

Cell counts were conducted at 24, 48, 72 and 96 hours for each concentration. Initial cell counts were performed only on control replicates. All EC 50 calculations were based on the nominal concentrations of 3.8, 7.5, 15, 30 and 60 mg/l since the 96-hour measured values were considerably lower (<0.10, not detectable) than the 0-hour measured values (101 ±8.1% of the nominal concentrations).

The growth data (cell counts) from the definitive test are presented in Table 2 and Figure 1. Logarithmic phase growth was confirmed at 96hours with a mean count of 1.3 X 10E6 cells/ml in the control, which was a 150 X increase f rom the initial 8.5 X 10E3 cells/ml. The growth data were subjected to a one way analysis of variance (ANOVA) and multiple means test (Dunnett's Test), which indicated a significant inhibition effect (P>0.05) on growth for the 3.8, 7.5, 15, 30 and 60 mg/l nominal test concentrations of n-Butyl Acrylate to Selenastrum capricornutum, as compared to the control after 96 hours. Therefore, the 96 hour no-observed effect level was estimated to be <3.8 mg/l. At 0-hour, pH measurements were taken on the residual solutions for the control and each concentration. At 96 hours, pH measurements were taken in an actual testing replicate. The pH values ranged from 7.2 to 7.9.

The 24, 48, 72 and 96 hour EC50 values for n-Butyl Acrylate based on cell counts, were 10, 6.2, 5.9 and 5.2 mg/l, respectively.

Test substance: TEST MATERIAL: Butyl Acrylate. The n-Butyl Acrylate standard (Lot number 5-0876-88, CAS #141-324) was received from Rohm and Haas Company on January 20, 1989, and was

stored at room temperature. The compound was contained in a one-quart clear glass jar and was observed to be a clear liquid. Upon receipt, the sample was frozen. Compound purity was given as 99.72% while stability was unspecified. This standard was used to prepare the test solutions for the algae toxicity test, spiking solutions for the fortification of the quality control samples, and spectrophotometry reference standards. Upon receipt, the standard was assigned ABC reference number TS-3044.

Reliability: (2) valid with restrictions
DATA QUALITY: Study was conducted in accordance with a recognized scientific procedure and followed OECD 201. The study results appear reasonable and provide sufficient information to support the conclusion.

Flag: Critical study for SIDS endpoint

28-MAR-2003 (68)

Species: other algae: Desmodesmus subspicatus CHODAT SAG 86.81
Endpoint: biomass
Exposure period: 72 hour(s)
Unit: mg/l **Analytical monitoring:** yes
EC10: = 1.3
EC50: = 3.18
EC90 : = 6.39

Method: OECD Guide-line 201 "Algae, Growth Inhibition Test"
Year: 2001
GLP: yes
Test substance: other TS: iso-butyl acrylate, purity 99.8 %

Remark: The analytical recovery rate was in all analysed test solutions below 80 %. The effective concentrations mentioned in the report were based on the median analytical recovery rate of 52,8 % (all measurements between 0 and 72 h).

The validity criteria for the test were fulfilled, ie:
· The EbC50 (72 h) of the control substance potassium dichromate was 0,5 mg/l
· The cell multiplication factor in the untreated control was after 72 hours: 68-fold.
· There was a variation of the pH-values within the test period of 72 h slightly more than 2 units in the control. However the growth of the algae was not inhibited.

Result: Effect on the development of biomass:
EbC10 (72 h) = 1,30 mg/L measured (2,47 mg/L nominal)
EbC50 (72 h) = 3,18 mg/L measured (6,02 mg/L nominal)
EbC90 (72 h) = 6,39 mg/L measured (12,1 mg/L nominal)

Effect on growth rate:
ErC10 (72 h) = 2,09 mg/L measured (3,96 mg/L nominal)
ErC50 (72 h) = 5,28 mg/L measured (10,0 mg/L nominal)
ErC90 (72 h) = 9,50 mg/L measured (18,0 mg/L nominal)
No observed effect concentration:
NOEC (72 h) = 0.82 mg/L measured (1.56 mg/L nominal)
Lowest observed effect concentration:
LOEC (72 h) = 1.65 mg/L measured (3.13 mg/L nominal)

Test condition: The test was performed in a closed system due to the volatility of the test substance.

concentrations tested (nominal): 0, 0.39, 6.25 and 100 mg/L. These were prepared by diluting the stock solution (111

mg/L). The test substance was stirred in OECD medium for about 20 min. at appr. 20 ± 2 °C.

The test medium was prepared in accordance with OECD Guideline 201.
pH : about 8
water hardness: calculated 0.24 mmol/l Ca/Mg, measured 0.28 mmol/l Ca/Mg
Temperature: 23 °C (max. temperature difference 2 °C)

Test vessel: Erlenmeyer flasks (nominal volume 250 mL) with glass plugs
Test volume: ca. 300 mL (Erlenmayer flasks were completely filled)
Inoculation density (cells/ml): 1 x 10e4
Number of replicates: 3
Illumination: artificial light, type universal white (e.g. OSRAM L25), permanent illumination
Light intensity: about 60-120 µE/(m2(superscript: .)s) at a wave length of 400 - 700 nm
Test parameter: in vivo chlorophyll-a-fluorescence (pulsed excitation with light flashes having a wavelength of 435 nm)
Measurement of fluorescence: after 0, 24, 48 and 72 h
Cell counting: after 72 h in a counting chamber (Neubauer improved) in replicate No. 2 of the inoculated control
Measurement of temperature: continuously during the whole test period
Measurement of pH-values: after 0 h and 72 h in an additional uninoculated replicate and after 72 h in the inoculated replicate no. 1 of each concentration.
Preparation of the stock solution and dilution

Statistical method: the EC values were calculated by linear regression analysis from the concentration-response curves. The LOEC was determined by comparing the means of the fluorescence measurement of the various concentrations with the control. The Duncan multiple range test was carried out at a 95% significance level. Every higher tested concentration must have at least the same or a stronger effect then the LOEC. The NOEC was the tested concentration immediately below the LOEC.

Concentration control analyses were carried out with test solutions of all concentrations (the non-inoculated replica were analysed at 0 and 72 hours).

Definitions:
* The LOEC is the lowest tested concentration at which - compared to an untreated control - a significant reduction of the algal cell divison was observed. Each tested higher concentration must have at least an effect equal or stronger than the LOEC.
* The NOEC is the tested concentration immediately below the LOEC.

Reliability: (1) valid without restriction
GLP guideline study

Flag: Critical study for SIDS endpoint

16-JAN-2004 (69)

Species: Scenedesmus quadricauda (Algae)
Exposure period: 8 day(s)

Unit: mg/l **Analytical monitoring:**
TGK : = 9.3

Method: other: cell growth inhibition test

Remark: TGK = Toxische GrenzKonzentration = toxic limit concentration
31-MAR-2003 (70)

Species: other algae
Exposure period: 96 hour(s)
Unit: mg/l **Analytical monitoring:**
EC50: 1.023

Method: other: SAR
Test substance: other TS: n-butyl acrylate

Remark: ECOSAR Program (v0.99g) Results
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
16-JAN-2004 (57)

Species: other algae

Exposure period: 96 hour(s)
Unit: mg/l **Analytical monitoring:**
EC50: 1.107

Method: other: SAR
Test substance: other TS: iso-butyl acrylate

Remark: ECOSAR Program (v0.99g) Results
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
16-JAN-2004 (57)

4.4 Toxicity to Microorganisms e.g. Bacteria

Type: other: bacterial inhibition
Species: activated sludge, industrial
Exposure period: 3 day(s)
Unit: mg/l **Analytical monitoring:**
EC0: > 150

Method: other
Year: 1995
GLP: yes
Test substance: other TS: n-butyl acrylate

Method: A series of test chambers containing a readily degradable primary substrate (d-glucose), dilution water, and inoculum was dosed with increasing amounts of the test substance. The dissolved oxygen (DO) concentration within each chamber was measured before and after an incubation period. Dilution water and primary substrate controls were included and used to check the acceptability of the dilution water and inoculum. Test substance concentrations that inhibited the oxidation of the primary substrate will exhibit an oxygen uptake rate less than that of the primary substrate controls. The concentrations used for the test substance were: 1, 3, 5, 10, 20, 50, 100, and 150 mg/l.

Result: Inhibition of oxidation of the primary substrate was not observed over the range of concentrations tested (i.e., 1.0 - 150 mg/l) since the line representing the average DO of the test chambers did not cross above the line representing the average residual primary substrate control DO.
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-MAR-2003 (71)

Type: aquatic
Species: activated sludge, domestic
Exposure period: 30 minute(s)
Unit: mg/l **Analytical monitoring:** no
EC50: > 1000
EC20 : > 1000
EC80 : > 1000

Method: OECD Guide-line 209 "Activated Sludge, Respiration Inhibition Test"
Year: 2001
GLP: yes
Test substance: other TS: iso-butyl acrylate, purity 99.8 %

Remark: EC values relate to nominal concentrations.
The following validity criteria were fulfilled:
- deviation of blank controls < 15 %
- EC50 of 3,5-dichlorophenol in the range of 5-30 mg/L
Test condition: Inoculum: activated sludge from laboratory wastewater plant treating municipal sewage. Concentration of dry substance 1 g/L.
Test temperature: 20 +/- 2 °C.
Test volume: 250 mL.
Synthetic medium: 8 mL/vessel 100-fold concentrated OECD medium.
oxygen concentration during aeration: > 2.5 mg/L.
oxygen concentration immediately before measurement: > 6.5 mg/L.
Duration of the measurement of oxygen consumption: 8-10 min.
pH (after correction): 7.7
Reliability: (2) valid with restrictions
Meets generally accepted scientific standards, with acceptable restrictions.
Flag: Critical study for SIDS endpoint
13-FEB-2003 (72)

Species: activated sludge

Remark: The inhibition of the deradation activity of adapted activated sludge is not anticipated when introduced in appropriate low concentrations.
31-MAR-2003 (13)

Species: Chilomonas paramaecium (Protozoa)
Exposure period: 48 hour(s)
Unit: mg/l **Analytical monitoring:**
TGK : = 3.5

Method: other: cell proliferation inhibition test
GLP: no

Remark: TGK = toxic limit concentration
Test condition: pH=6.9
01-AUG-2002 (73)

Species: Entosiphon sulcatum (Protozoa)
Exposure period: 72 hour(s)
Unit: mg/l **Analytical monitoring:**
TGK : = 50

Method: other: cell proliferation inhibition test
GLP: no

Remark: TGK = toxic limit concentration
Test condition: pH 6.9
01-AUG-2002 (74)

Species: Microcystis aeruginosa (Bacteria)
Exposure period: 192 hour(s)
Unit: mg/l **Analytical monitoring:**
TGK : = 1.3

Method: other: cell proliferation inhibition test
GLP: no

Remark: TGK = toxic limit concentration
01-AUG-2002 (70)

Species: Pseudomonas putida (Bacteria)
Exposure period: 16 hour(s)
Unit: mg/l **Analytical monitoring:**
TGK : = 80

Method: other: cell proliferation inhibition test

Remark: TGK = toxic limit concentration
01-AUG-2002 (75)

Species: Uronema parduzci (Protozoa)
Exposure period: 20 hour(s)
Unit: mg/l **Analytical monitoring:**
TGK : = 21

Method: other: cell proliferation inhibition test
GLP: no

Remark: TGK = toxic limit concentration
Test condition: pH=6.9
01-AUG-2002 (76)

Species: other bacteria: bacteria unacclimated
Exposure period: 3 day(s)

Method: other: BOD-Test

Remark: TGK = 1.17 mM (toxic limit concentration)
Test condition: 20 °C
01-AUG-2002 (77)

Species: other bacteria: bacteria, acclimated
Exposure period: 3 day(s)

Method: other: BOD-Test

Remark: TGK = 2.1 mM (toxic limit concentration)
Test condition: 20 °C; 70 days adaptation
01-AUG-2002 (78)

4.5 Chronic Toxicity to Aquatic Organisms

4.5.1 Chronic Toxicity to Fish

Remark: No data.
23-OCT-1995

4.5.2 Chronic Toxicity to Aquatic Invertebrates

Species: other

Remark: no data are available
23-OCT-1995

Remark: No data.
23-OCT-1995

TERRESTRIAL ORGANISMS

4.6.1 Toxicity to Sediment Dwelling Organisms

4.6.2 Toxicity to Terrestrial Plants

4.6.3 Toxicity to Soil Dwelling Organisms

Type: other

Remark: no data are available
23-OCT-1995

4.6.4 Toxicity to other Non-Mamm. Terrestrial Species

Species: other avian: Redwinged blackbirds
Expos. period: 18 hour(s)
Unit: mg/kg bw
LC50: > 103

23-OCT-1995 (79)

Remark: Acute ca. toxicity for cold-blooded animals: 100 - 1000 mg/l.
23-OCT-1995 (59)

4.7 Biological Effects Monitoring

4.8 Biotransformation and Kinetics

4.9 Additional Remarks

Memo: more information see BUA-report no. 129

18-AUG-1999

Remark: For more information see BUA-report N-BUTYLACRYLAT
29-JUL-2002

Remark: German water pollution class (WGK) 1. Evaluation numbers: 4.6 (fish toxicity), 4.1 (bacteria toxicity), 1 (mammalian toxicity).
Toxic to aqueous organismn: 100 - 1000 mg/l (LD50/96 hours).
23-OCT-1995 (59) (80)

5.0 Toxicokinetics, Metabolism and Distribution

In Vitro/in vivo: In vitro
Type: Metabolism

GLP: yes
Test substance: other TS

Remark: n-Butyl acrylate, isobutyl acrylate and tert. butyl acrylate were tested for relative rates of hydrolysis by mammalian esterase.

The assays were conducted in a total volume of 10 ml in capped vials in 0.1 M sodium phosphate buffer at pH 7.3 at 37°C under conditions (0.15 units of enzyme/ml with aliquots removed for analysis at 2 and 5 min after the addition of enzyme to the substrate) that approximate the initial rate. The reaction conditions were determined based on pilot studies. Reactions were terminated by the addition of an equal volume 1.0 M phosphoric acid. A terminal hydrolysis sample was also taken at 3 hr following reaction initiation for analysis. A negative control reaction with buffer and eacht test compound but no enzhyme was conducted at each concentration for the 2 and 5 min time points.
Reaction rates were determinded by loss of substrate and formation of hydrolysis product. Product formation was monitored by analyzing aliquots of the quenched reaction bx HPLC.

Enzyme source:
Porcine hepatic esterase (EC 3.1.1.1; Product Code E-2884; Lot 107H7016) as a suspension in 3.2 M ammonium sulfate solution was procured from Sigma Chemcial Co., St.Louis, Missouri. According to the label information provided by the supplier, the concentration of the enzyme was 15 mg protein/ml (biuret) and the activity was 250 units/mg.

Result: n-Butyl acrylate and isobutyl acrylate are rapidly hydrolyzed at comparable rates (up to 75 µmoles/mg/mg protein resp. up to 62 µmoles/mg/mg protein) by a representative mammalian esterase (porcine hepatic esterase).
At concentrations of 0.2, 0.5 and 2.0 mM, conversion rates of n-butyl acrylate ranged between 54-69 µmoles/min/mg protein (4 -- 33 %) after 2 minutes and 43-72 µmoles/min/mg protein (10 --68 %) after 5 minutes of incubation at 37°C.
In contrast, the tert. butyl acrylate did not appear to be substrate for this mammalian esterase, since little or no enzyme-catalyzed hydrolysis was detected under the reaction conditions.

Reliability: (2) valid with restrictions
The study meets currents scientific criteria

Flag: Critical study for SIDS endpoint
14-NOV-2002 (81)

In Vitro/in vivo: In vivo
Type: Metabolism
Species: rat
Doses, males: oral: 4; 40; 400 mg/kg; i.v. 40 mg/kg

Result: Male F344 rats (8-10 weeks old, 180 - 220 g) were administered butyl[2,3-14C-labelled)acrylate by i.v. injection or by gavage.

After oral administration the labelled butyl acrylate was rapidly absorbed and metabolized. The acrylate moiety was metabolized primarily to CO2, accounting for elimination of up to 75 % of the administered radiolabel. Elimination in urine and feces accounted for approximately 10 and 2 % of the dose, respectively.

After i.v. administered the inital clearance of radioactivity from the tissues was very rapid and the decreased to a negligible rate after 2 hours.

Total radioactivity in the major tissues (adipose, muscle, liver, skin) was relatively constant from 2 to 24 hours. The majority of radioactivity in blood at 24 hr was found to be covalently bound to the protein fraction of the red blood cell membranes. There was some evidence of first-pass effect when butyl acrylate was administered by gavage because i.v. administration resulted in less metabolism to CO2 (45.3 % after 24 h) and quantitative differences in urinary metabolites (15.6 % of radioactivity after 24 h). After i.v. administration it seemed that there was a slight shift of metabolism towards GSH conjugation.
The two major metabolites in urine were identified as N-acetyl-S-(2-carboxyethyl)cysteine and N-acetyl-S-(2-carboxyethyl)cystein-S-oxide. The authors discussed that the conjugation of this minor pathway may occur between GSH and intact n-butyl acrylate, the isolation of S-(2-carboxyethyl)glutathione butyl ester in bile provides further evidence that this conjugation occurs before hydrolysis of the ester.
Results of this study indicated that the major portion of butyl acrylate dose was hydrolyzed to acrylic acid, which was further metabolized to compounds avialable for oxidative metabolism.

Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
07-JAN-2003 (82)

In Vitro/in vivo: In vivo
Type: Metabolism
Species: rat
No. of animals, males: 72
Doses, males: 100 mg/kg
Route of administration: other: gavage; i.p.

Remark: The disposition of butyl-(2,3-14C)-acrylate has been studied following i.p. and oral (gavage) application.
Most of the administrated acrylate underwent rapid metabolism and excretion with expired air (more than 70 % of the dose) and urine (15 -22 %). Most of 14C found in tissues was associated wiht the liver and kidneys. The level of 14C associated with most of the examined tissues remained unchanged, at least for the first 8 - 10 hours, followed by its fairly rapid loss.
31-AUG-2001 (83)

5.1 Acute Toxicity

5.1.1 Acute Oral Toxicity

Type: LD50
Species: rat
Sex: male
No. of Animals: 19
Value: = 9050 mg/kg bw

Method: other
Year: 1971
GLP: no
Test substance: other TS: n-butyl acrylate, commerial grade

Method: The non-fasted rats were administered the compound via stomach intubation.
Result: Livers were mottled and pale; kidneys were pale. In conclusion, the test substance produced slight acute peroral toxicity.
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
02-AUG-2002 (84)

Type: LD50
Species: rat
Value: ca. 3143 mg/kg bw

Method: other: BASF test
GLP: no
Test substance: other TS: Butyl acrylate, no further data

Remark: Five to 10 rats (no data about sex) were used per dose. The test article was administered by gavage at doses of 1832, 2838 and 4500 mg/kg (2.040; 3.160; 5.010 ml/kg). Animals were observed over a period of 7 days after administration of the test article. In a pre-test rats were given 1131 mg/kg (1.260 ml/kg) and 4500 mg/kg (5.010 ml/kg); no rat died in the lower dose, 3/8 rats died in the high dose.

mortality:

Dose(mg/kg)	no. animals	1h	24h	484	7days
1832	5	0/5	1/5	1/5	1/5
2838	5	0/5	2/5	2/5	2/5
4500	10	0/10	4/10	8/10	8/10

symptoms:
1832 mg/kg: only piloerection on the day after substance administration
2838 mg/kg: piloerection, one rat had diarrhoe
4500 mg/kg: piloerection, labored breathing, prone position
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint

02-AUG-2002 (85)

Type: LD50
Species: rat
Sex: male

No. of Animals: 20
Vehicle: other: Tergitol
Value: = 3730 mg/kg bw

Method: other
Year: 1950
GLP: no
Test substance: other TS: n-butyl acrylate, commerial grade

Method: N-butyl acrylate had a R.F. LD50 of 3.73 gm/kg for non-fasted male albino Sherman strain rats fed either a 10 or 20% dispersion in 1% aqueous "Tergitol" 7 by stomach tube. Deaths in most instances occurred within 24 hours after administration of the doses.
Result: N-butyl acrylate was moderately toxic for rats by the oral route as indicated by a R.F. LD50 of 3.73 gm/kg. It was about twice as toxic as ethylbutyl acrylate. Autopsy of victims revealed hemorrhagic lungs, hemorrhage of the gastrointestnal tract and congestion of the kidney and peritoneal wall. There was considerable amount of fluid in the peritoneal cavity and in the pleural cavity as well. Adhesions of the testines occurred in the rat that survived 10 days before death.
02-AUG-2002 (86)

Type: LD50
Species: rat
Value: = 8125 mg/kg bw

Remark: Original data reported: 9.05 ml/kg
31-MAR-2003 (87)

Type: LD50
Species: rat
Value: = 3140 mg/kg bw

Method: other: BASF-Test
GLP: no
Test substance: other TS: n-butyl acrylate, no further data

02-AUG-2002 (88)

Type: LD50
Species: rat
Value: = 6220 mg/kg bw

23-OCT-1995 (89)

Type: LD50
Species: rat
Value: = 4920 mg/kg bw

Remark: Female animals
29-JUL-2002 (90)

Type: LD50
Species: rat
Value: = 6170 mg/kg bw

Remark: male animals
29-JUL-2002 (90)

Type: LD50
Species: rat
Value: = 900 mg/kg bw

23-OCT-1995 (91)

Type: LD50
Species: mouse
Value: = 5380 mg/kg bw

23-OCT-1995 (89)

Type: LD50
Species: mouse
Value: = 7550 mg/kg bw

23-OCT-1995 (92)

Type: LD50
Species: mouse
Value: = 756 mg/kg bw

Method: other: no data
GLP: no data
Test substance: no data

23-OCT-1995 (58)

Species: rabbit
Value: 900 - 3600 mg/kg bw

Method: other: BASF-Test
GLP: no
Test substance: other TS: n-butyl acrylate, commerial grade

Remark: Mortality:
900 mg/kg (1 ml/kg): none of the two rabbits died; 1800 mg/kg one out of two animals died; 3600 mg/kg both animals died (tested as 10 and 20% aqueous tragacanth emulsion, respectively)
02-AUG-2002 (93)

Species: cat
Value: 450 - 900 mg/kg bw

Method: other: BASF-Test
GLP: no
Test substance: other TS: n-butyl acrylate, commerial grade

Remark: Mortality:
450 mg/kg (0,5 ml/kg): one cat survived; 900 mg/kg one animal dies 2 1/2 days after application (tested as 10 and 20% aqueous tragacanth emulsion, respectively)
02-AUG-2002 (94)

5.1.2 Acute Inhalation Toxicity

Type: LC50
Species: rat
Sex: male/female
Exposure time: 4 hour(s)
Value: = 10.3 mg/l

Method: other: BASF test
GLP: no
Test substance: other TS: Butyl acrylate, technical grade

Remark: Ten male and 10 female rats (Sprague-Dawley) were exposed by head-nose exposure per dose. The analyzed concentrations used were 2.7, 3.6, 4.96, 6.8, 8.1, 12.1 and 16.0 mg/l as a vapor. The animals were observed over a 14 day period after exposure. No animals died in the 2.7, 3.6 and 4.96 mg/l dose groups, respectively. One out 20, 4/20, 13/20 and 20/20 died in the 6.8, 8.1, 12.1 and 16.0 mg/l dose groups, respectively. Statistical analysis were made according to Probit-Analysis, D.J. Finney, 1971.
No clinical symptoms were observed in the 2.7 mg/l dose group. In the 3.6 mg/l dose group spasmodically breathe and prone position were observed, as well as unregular gait.
In the 4.96 to 8.1 mg/l dose groups eye and nasal secretion, noisy breathing and piloerection were additionally observed. Additional clinical signs in the two highest dose groups were dyspnea, trembling and closed eyelids.
Test substance: purity: technical grade
Reliability: (1) valid without restriction
study meets current guideline criteria
Flag: Critical study for SIDS endpoint
31-JUL-2002 (95)

Type: LC100
Species: rat
Sex: male
No. of Animals: 18
Exposure time: 4 hour(s)
Value: = 2000 ppm

Method: other
Year: 1950
GLP: no
Test substance: other TS: n-butyl acrylate, commerial grade

Method: Four hour exposures of rats were made of concentrations of 2000, 1000, and 500 ppm in a saturated vapor at room temperature.
Remark: The LC50 value was 758 ppm (as quoted by the 1971 assay)
Result: The following mortalities were obtained when rats were exposed to substantially saturated vapor produced at room termperature: 6 of 6 rats died in 2 hours, 5 of 6 in 1 hour, and 0 of 6 in 30 minutes. The vapors evolved at room temperature constitute a definite hazard in relatively short exposures and should not be inhaled. This concentration is lethal to the majority of rats exposed for a 4-hour period.
28-MAR-2003 (84) (86)

Type: LC50
Species: rat
Sex: male
No. of Animals: 12
Exposure time: 4 hour(s)
Value: = 1414 ppm

Method: other
Year: 1971
GLP: no
Test substance: other TS: n-butyl acrylate, commerial grade

Method: Vapor at metered concentration, not checked analytically, is generated by feeding the liquid at a constant rate down the inside of a spirally corrugated surface of a minimally heated one inch Pyrex tube, through which metered air is passed.
Remark: LC50 8.08 mg/l/4 h
Result: Slight loss of coordination and extremities irritated at 2 hours; gasping at 3 hours and 45 minutes. In victims, lungs were congested. In survivors, one had blood in his intestine; 2 had small areas of pneumonia; the others appeared normal.
28-MAR-2003 (84)

Type: LC50
Species: rat
Strain: Sprague-Dawley
Sex: male/female
No. of Animals: 10
Exposure time: 1 hour(s)
Value: = 4398 ppm

Method: other
Year: 1989
GLP: no
Test substance: other TS: n-butyl acrylate, commerial grade

Method: One group containing five male and five female Sprague-Dawley albino rats, was expsed once for on hour to vapor from butyl acrylate. Animals were observed for 14 days postexposure. The mean concentration of buryl acrylate for the exposure was 4398 ppm. This concentration was the highest obtainable without producing a visual aerosol. All animals were observed for signs of toxic effects on the day of exposure and daily following exposure. A complete necropsy was performed for all animals.
Remark: LC50 25.1 mg/l/1h
Result: A single 1-hr, dynamically-generated vapor exposure to a nearly saturated atmosphere of 4398 ppm butyl acrylate produced 30% mortality. (The calculated saturated vapor concentration of butyl acrylate at 20 degrees C, 740 mmHg is 4460 ppm). No visual aerosol was observed in the breathing zone of the animals. Mortality was observed for both sexes (males 20%, females 40%). All deaths occurred within the first two days of postexposure. Clinical signs were observed only on the day of exposure and during the first four days postexposure, and included lacrimation, erythema of the paws, and ocular and respiratory irritation. A loss of body weight was observed for all animals during the first week of postexposure. With the exception of one female rat,

body weight gain was observed for all animals during the second week of the postexposure period. Macroscopic lesions were observed only in animals that died and included a red or purple discoloration of the lungs and liver.

Reliability: (1) valid without restriction

28-MAR-2003 (96)

Type: LC50
Species: rat
Sex: male/female
Exposure time: 4 hour(s)
Value: = 13.3 mg/l

Method: other: BASF test
GLP: no
Test substance: other TS: Butyl acrylate, 99.5 % pure

Remark: Ten male and 10 female rats (Sprague-Dawley) were used per dose. Food was withheld from the animals for about 16 hours prior to exposure to the vapors of the substance. The analyzed concentrations used were 6.1, 11.0, 12.0, 16.0 and 18.2 mg/l. The animals were observed over a 14 day period after exposure. No animals died in the lowest dose group. Three out 20, 5/20, 18/20 and 19/20 died in the 11.0, 12.0, 16.0 and 18.2 mg/l dose groups, respectively.

Reliability: (2) valid with restrictions

10-AUG-1999 (97)

Type: LC50
Species: rat
Sex: male/female
Exposure time: 4 hour(s)
Value: = 11.9 mg/l

Method: other: BASF test
GLP: no
Test substance: other TS: Butyl acrylate, 99.5 % pure

Remark: Ten male and 10 female rats (Sprague-Dawley) were used per dose. The animals were not starved prior to exposure to the vapors of the substance. The analyzed concentrations used were 5.9, 8.1, 11.27, 11.4, 15.7, 17.4 and 24.2 mg/l. The animals were observed over a 14 day period after exposure. No animals died in the low dose group. Two out of 20, 5/20, 11/20, 18/20, 18/20 and 20/20 died in the 8.1, 11.27, 11.4, 15.7, 17.4 and 24.2 mg/l dose groups, respectively.

Reliability: (2) valid with restrictions

29-JUN-1999 (97)

Type: LC50
Species: rat
Value: = 13.8 mg/l

Remark: No details on exposure time

29-JUL-2002 (89)

Type: LC50
Species: rat
Exposure time: 4 hour(s)
Value: = 14.5 mg/l

23-OCT-1995 (98)

Type: LCLo
Species: rat
Exposure time: 4 hour(s)
Value: = 2730 ppm

23-OCT-1995 (99)

Type: other
Species: rat
Exposure time: 1 hour(s)
Value: = 33.8 mg/l

Remark: Two out of five male animals died (2/5).
29-JUL-2002 (90)

Type: other
Species: rat
Exposure time: 1 hour(s)
Value: = 27.1 mg/l

Remark: Four out of five female animals died (4/5).
29-JUL-2002 (90)

Type: other: IRT
Species: rat
Exposure time: 30 minute(s)

Remark: No death occurred after 30-min-exposure to saturated atmosphere
29-JUL-2002 (100)

Type: other: IRT
Species: rat
Exposure time: 4 hour(s)
Value: = 5.32 mg/l

Remark: Five out of six animals died when exposed to a concentration of 1000 ppm for 4 hours.
29-JUL-2002 (100)

Type: other: IRT
Species: rat
Exposure time: 4 hour(s)

Method: other: BASF-Test
GLP: no
Test substance: other TS: n-butyl acrylate, no further data

Remark: No mortality occurred when exposed to saturated atmosphere for 1 hour. Exposition for a longer-term resulted in mortality.
02-AUG-2002 (88)

Type: other: IRT
Species: rat
No. of Animals: 6
Exposure time: 4 hour(s)
Value: = 5.32 mg/l

Remark: One animal died (1/6) when exposed to 1000 ppm (5.32 mg/l) for 4 hours.
29-JUL-2002 (87)

Type: other: Inhalation Risk Test
Species: rat
Sex: male/female

Method: other: BASF test
GLP: no
Test substance: other TS: Butyl acrylate, with 0.05% 1,4-benzenediol

Remark: The rats (albino) were exposed to a 20 degree C highly saturated vapor-air-mixture for 1, 2 or 4 hours. A total of 3 animals per sex were used for each experiment. The animals were observed for mortality for a period of 14 days after treatment. No animals died from the one hour exposure, 5/6 died from the 2 hour exposure and all animals died from the 4 hour exposure.
Reliability: (2) valid with restrictions
02-AUG-2002 (101)

Type: LC50
Species: mouse
Sex: male/female
Exposure time: 4 hour(s)
Value: = 6.8 mg/l

Method: other: BASF test
GLP: no
Test substance: other TS: Butyl acrylate, 99.5 % pure

Remark: Ten male and 10 female mice (NMRI) were used per dose. The animals were not starved prior to exposure to the vapors of the substance. The analyzed concentrations used were 3.1, 4.2, 5.9, 11.4 and 15.7 mg/l. The animals were observed over a 14 day period after exposure. No animals died in the low dose group. One out of 20, 7/20, 19/20 and 20/20 died in the 4.2, 5.9, 11.4 and 15.7 mg/l dose groups, respectively.
Reliability: (2) valid with restrictions
29-JUN-1999 (97)

Type: LC50
Species: mouse
Sex: male/female
Exposure time: 4 hour(s)
Value: = 7.2 mg/l

Method: other: BASF test
GLP: no
Test substance: other TS: Butyl acrylate, 99.5 % pure

Remark: Ten male and 10 female mice (NMRI) were used per dose. Food was withheld from the animals for about 16 hours prior to exposure to the vapors of the substance. The analyzed concentrations used were 3.0, 3.7, 6.1, 9.6, 11.1 and 15.7 mg/l. The animals were observed over a 14 day period after exposure. No animals died in the low dose group. One out of 20, 9/20, 15/20, 15/20 and 20/20 died in the 3.7, 6.1, 9.6,

11.1 and 15.7 mg/l dose groups, respectively.
Reliability: (2) valid with restrictions
29-JUN-1999 (97)

Type: LC50
Species: mouse
Value: > 30.6 mg/l

Remark: No information on exposure time
29-JUL-2002 (89)

Type: LC50
Species: mouse
Exposure time: 2 hour(s)
Value: = 7.8 mg/l

23-OCT-1995 (102) (91)

Type: LC50
Species: hamster
Sex: male/female
Exposure time: 4 hour(s)
Value: = 8.8 mg/l

Method: other: BASF test
GLP: no
Test substance: other TS: Butyl acrylate, 99.5 % pure

Remark: Ten male and 10 female hamsters (Chinese) were used per dose. Food was withheld from the animals for about 16 hours prior to exposure to the vapors of the substance. The analyzed concentrations used were 3.7, 6.1, 9.6, 11.1 and 15.7 mg/l. The animals were observed over a 14 day period after exposure. No animals died in the low dose group. Two out of 20, 11/20, 17/20 and 20/20 died in the 6.1, 9.6, 11.1 and 15.7 mg/l dose groups, respectively.
Reliability: (2) valid with restrictions
28-MAR-2003 (103)

Type: LC50
Species: hamster
Sex: male/female
Exposure time: 4 hour(s)
Value: = 6.39 mg/l

Method: other: BASF test
GLP: no
Test substance: other TS: Butyl acrylate, 99.5 % pure

Remark: Ten male and 10 female hamsters (Chinese) were used per dose. Food was not withheld from the animals prior to exposure to the vapors of the substance. The analyzed concentrations used were 3.13, 4.2, 5.94 and 11.39 mg/l. The animals were observed over a 14 day period after exposure. No animals died in the low dose group. One out of 20, 7/20 and 20/20 died in the 4.2, 5.94 and 11.39 mg/l dose groups, respectively.
Reliability: (2) valid with restrictions
29-JUN-1999 (103)

5.1.3 Acute Dermal Toxicity

Type: LD50
Species: rabbit
Sex: male
No. of Animals: 15
Value: = 3024 mg/kg bw

Method: other
Year: 1950
GLP: no
Test substance: other TS: n-butyl acrylate, commerial grade

Method: The LD50 for rabbits whose clipped trunks were in contact with the undiluted compound for a 24-hour period followed by 13 days of observation was 3.36 ml/kg. The dose was retained by "Vinylite" film.
Result: Erythema and necrosis of the skin was apparent. Autopsy of those rabbits which succumbed revealed pale, greyish livers, pale kidneys with prominent surface markings, congestion of the intestines and their mesenteries and occasionally bloody urine.
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
14-NOV-2002 (86)

Type: LD50
Species: rabbit
Sex: male
No. of Animals: 12
Value: = 2000 mg/kg bw

Method: other
Year: 1971
GLP: no
Test substance: other TS: n-butyl acrylate, commerial grade

Method: Male albino rabbits, are immobilized during the 24-hour contact period with the compound retained under impervious sheeting on the clipped intact skin of the trunk. Thereafter, excess fluid is removed to prevent ingestion.
Result: Iritis occurred in the eyes during the 24 hour exposure period with butyl acrylate. Livers were found to be mottled, with prominent acini; kidneys and spleens were congested in victims. In conclusion, moderate acute toxicity occurred following a covered dermal application.
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
02-AUG-2002 (84)

Type: LDLo
Species: rat
Value: = 1700 mg/kg bw

23-OCT-1995 (104)

Type: other: risk of absorption
Species: rat

Method: other: BASF-Test
GLP: no

Test substance: other TS: n-butyl acrylate, no further data

Remark: A four hour exposition of the abdominal skin to 2ccm undiluted butyl acrylate revealed no signs of absorptive intoxication.

02-AUG-2002 (105)

Type: LD50
Species: rabbit
Sex: male
Value: = 5660 mg/kg bw

29-JUL-2002 (90)

Type: LD50
Species: rabbit
Value: = 2000 mg/kg bw

23-OCT-1995 (99)

Type: LDLo
Species: rabbit
Value: = 1700 mg/kg bw

23-OCT-1995 (104)

Type: other: risk of absorption
Species: rabbit

Method: other: BASF-Test
GLP: no
Test substance: other TS: n-butyl acrylate, no further data

Remark: A 24 hr-exposition of the clipped skin (back, ca. 50 cm2) to 0,2 cm3 undiluted test substance/kg bw resulted in inflammatory effects with redness and spreading edema followed by crust and scale formation. Signs of adsorptive intoxication were not observed.

02-AUG-2002 (105)

5.1.4 Acute Toxicity, other Routes

Type: LD50
Species: rat
Route of admin.: i.p.
Value: = 550 mg/kg bw

23-OCT-1995 (106)

Type: LD50
Species: mouse
Route of admin.: i.p.
Value: = 180 mg/kg bw

Method: other: BASF test
GLP: no
Test substance: other TS: Butyl acrylate, no futher data

Remark: Five to 10 mice (Roessling) were used per dose. The test article was administered at doses of 71, 113, 183, 284, 450, 713, 1131 and 1832 mg/kg. Animals were observed over a period of 7 days after administration of the test article.

The mortalities observed were 0/10, 4/10, 6/10, 5/10, 5/5, 5/5, 5,5 and 5/5 in the 71, 113, 183, 284, 450, 713, 1131 and 1832 mg/kg groups, respectively.
Reliability: (2) valid with restrictions
24-JUN-1999 (101)

Type: LD50
Species: mouse
Route of admin.: i.p.
Value: = 1630 mg/kg bw

23-OCT-1995 (89)

Type: LD50
Species: mouse
Route of admin.: i.p.
Value: = 853 mg/kg bw

23-OCT-1995 (107)

5.2 Corrosiveness and Irritation

5.2.1 Skin Irritation

Species: rabbit
Concentration: undiluted
Result: irritating

Method: other: BASF test
GLP: no
Test substance: other TS: Butyl acrylate, 99% pure

Remark: Rabbits (White-Vienna) were exposed to the test substance (unchanged, occlusive) in a piece of test patch for one minute, 5 minutes, 15 minutes and 20 hours, with two animals per exposure time. After the exposure period, the treated area was washed with a soapy liquid. Observation times: 24 hours and 8 days after removing the patches
Result: After 24 hours moderate to strong erytheme and edema were observed in all exposure groups, the 20 hour exposure also caused weak necrosis.
The effects were reversible and much weaker after 8 days.
Test substance: purity: ca. 99%
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-JUL-2002 (108)

Species: rabbit
Concentration: undiluted
Exposure: Open
Result: slightly irritating

Method: other
Year: 1950
GLP: no
Test substance: other TS: n-butyl acrylate, commerial grade

Method: N-butyl acrylate was applied undiluted and uncovered in the vesicant test on a rabbits belly.

Result: Undiluted n-butyl acrylate caused minor capillary injection when applied to the clipped skin of the rabbit belly in the vesicant test. It falls in Grade 2 of the 10 grade rating system.
02-AUG-2002 (86)

Species: rabbit
Concentration: undiluted
Exposure: Open
Exposure Time: 24 hour(s)
No. of Animals: 5
Result: slightly irritating

Method: other
Year: 1971
GLP: no
Test substance: other TS: n-butyl acrylate, commerial grade

Method: The undiluted chemical was applied in 0.01 ml amounts to clipped, uncovered intact skin of 5 rabbit bellies.
Result: Minor irritation resulted when the undiluted material was applied uncovered to rabbits skin. A moderate capillary injection on 3, moderate erythema on 1, and marked erythema on one rabbit.
02-AUG-2002 (109)

Species: rabbit
Exposure: Occlusive
Exposure Time: 4 hour(s)
Result: irritating

Method: other

Remark: Method: intact and abraded skin,
29-JUL-2002 (110)

Species: rabbit
Result: not irritating

Method: other: BASF-Test
GLP: no
Test substance: other TS: n-butyl acrylate, no further data

02-AUG-2002 (105)

Species: rabbit
Concentration: 500 mg
Exposure: Open
Result: irritating

Remark: The irritation is described as "mild".
29-JUL-2002 (111)

Species: rabbit
Result: irritating

Method: other: BASF-Test
GLP: no
Test substance: as prescribed by 1.1 - 1.4

23-OCT-1995 (112)

Species: guinea pig

Method: other

Remark: The highest non-irritating concentration for Dunkey-Hartley-guinea pigs is 3 M and for Himalayan-white-spotted guinea pigs 0.1 M (both in Methyl-Ethyl-Ketone: peanut oil = 2:1; to compare.: 0.5 M correspond to a approx. 7% solution (w/w%)).

29-JUL-2002 (113)

Remark: No test datas. Butyl acrylate is classified to be a skin irritant (moderate - hard) according to §4a German GefStoffV (Annex 1, 67/548/EEC and amendments).

23-OCT-1995 (114)

5.2.2 Eye Irritation

Species: rabbit
Concentration: undiluted
Dose: .5 ml
Exposure Time: 24 hour(s)
Comment: not rinsed
No. of Animals: 5
Result: irritating

Method: other
Year: 1971
GLP: no
Test substance: other TS: n-butyl acrylate, commerial grade

Method: Eyes not stained with 5% fluorescein in 20 seconds contact are accepted. 0.5 ml of the undiluted test substance was instilled into 5 rabbits.
Result: 0.5 ml quantities produced no injury on 1, moderate to severe injury on 4 eyes (2 with iritis).
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint

02-AUG-2002 (115)

Species: rabbit
Result: irritating

Method: other: BASF test
GLP: no
Test substance: other TS: Butyl acrylate, no further data

Remark: A drop of the substance was placed unchanged in the eye. After 10 minutes, 1, 3 and 24 hours or until the irritation subsided, observations were made. The substance caused slight corneal cloudiness.

31-JUL-2002 (116)

Species: rabbit
Concentration: undiluted
Dose: .5 ml
Comment: not rinsed
Result: highly irritating

Method: other

Year: 1950
GLP: no
Test substance: other TS: n-butyl acrylate, commerial grade

Method: 0.5 ml of uniluted chemical was instilled in rabbit eyes.
Result: Rabbit eyes were severly damaged by 0.5 ml doses and moderately injured by 0.1 ml. The places the compound in grade 3 of the 10 grade eye burn rating system.
02-AUG-2002 (86)

Species: rabbit
Concentration: 500 mg
Exposure Time: 24 hour(s)
Result: irritating

Remark: The irritation was described as "mild".
29-JUL-2002 (117)

5.3 Sensitization

Type: Freund's complete adjuvant test
Species: guinea pig
Result: sensitizing

Method: The test compound (purity > 99%) was tested in the Freund Complete Adjuvans (FCA) Test in guinea pig.

Eight Dunkin Hartley guinea pigs (test group) and 4-6 animals (control) were used in this study. Induction was performed on days 0, 2, 4, 7 and 9 by injection into teh shoulder area. A total of 0.1 ml of test compound emulsified with adjuvans followed by dilution in distilled water to give a 0.5 M (7%) aqueous preparation was given at each injection. Challenge was performed on day 21 (right flank) or 35 (left flank) of the study with 3 M (21% test compound in the vehicle methyl ethyl ketone/peanut oil 2:1). This was reported the maximum non irritant concentration in this strain of guinea pigs.
Result: Positive reaction in the test group is reported in all 8 animals at the first and second challenge. The results of the control group animals were not mentioned.
Test substance: purity, >99%
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-JUL-2002 (113)

Type: Guinea pig maximization test
Species: guinea pig
Result: sensitizing

Method: The test compound (purity > 99%) was tested in the guinea pig maximisation test. Ten Himalayan white spotted guinea pigs (test group) and 6 animals (control) were used in this study. The intradermal induction concentration was 0.5 M (7% test compound in the vehicle peanut oil), the dermal induction concentration was 1 M (14% the vehicle methyl ethyl ketone/peanut oil 2:1). The challenge was performed 14 and 21 days after the dermal induction with the maximum non irritant concentration of 0.1 M (1.4% the vehicle methyl ethyl ketone/peanut oil 2:1).

Result: Positive reaction in the test group is reported in 7 out of 10 animals at the first and second challenge. The results of the control group animals were not mentioned.
Test substance: purity, >99%
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-JUL-2002 (113)

Type: Mouse ear swelling test
Species: mouse
Vehicle: other: acetone
Result: not sensitizing

Method: other
Test substance: other TS: n-butyl acrylate; purity > 99 %

Method: In a pre-test concentrations of 10, 20 and 30 % were selected for sensitizing doses and 30 % was selected for challenge.
8 mice per group were tested.
Beginning on day 1, exposures were accomplished by the direct application of 50 µl of the test article, DNFB (2,4-Dinitrofluorobenzene) or vehicle to the prepared site with a pipette. Following application, the animals were restrained long enough to allow the vehicle to start to volatilize. The sensitization procedures of day 1 were repeated on days 2 and 3. Mice were then rested fo days 4-7. On day 8, the thickeness of the right ear of each mouse was premeasured. After measurement on day 8, mice were challenged on the dorsal and ventral surfaces of the right ear pinna with a total of 25 µl, divided between the two sides, of either vehicle, test articel or DNFB. The same ears were then measured 24 and 48 hours after challenge. Recorded raw data consits of premeasurements, 24 and 48 hr postmeasurement of the thickness of 2 sites on the right ear of all mice. The percent ear swelling was calculated as follows:
[(mean thickness of the right ear (24 or 48 hrs post treatment) / mean thickness of the premeasured right ear) X 100] - 100.
The mean percent ear swelling for each dose group was calculated and compared to the BC for significance and dose response.
Result: The mouse ear swelling test did not indicate n-butyl acrylate as a sensitizer in female B6C3F1 mice.
Sensitization with concentraions of 10; 20 or 30 % n-butyl acrylate followed by a challenge with 30 % n-butyl acrylate did not show a significant change in percent ear swelling at either 24 or 48 hrs post challenge as compared to the 30 % challenge only group.
Reliability: (2) valid with restrictions
well documented study

Flag: Critical study for SIDS endpoint
31-JUL-2002 (118)

Type: Mouse local lymphnode assay
Species: mouse
Vehicle: other: acetone
Result: sensitizing

Method: other
Test substance: other TS: n-butyl acrylate, purity > 99%

Method: Due to pre-tests doses of 10; 20 and 30 % were chosen for the local lymph node assay.
8 mice per group were tested.
On day 1, mice were treated with the appropriate concentration of the substance applying 25 µl, divided between the dorsal and ventral surfaces, to both the left and right ear. Identical treatments were repeated for the next two days. On day 4, the mice were rested. On day 5, all mice were injected with 0.2 ml (20 mCi) 3H-thymidine i.v. by tail vein. Approximately 5 hours after injection, mice were sacrificed and both auricular lymph nodes, right and left, from each mouse were excised and put into tubes with 4 ml PBS. All lymph nodes were dissociated by grinding between the frosted ends of two microscope slides. Cells were washed twice in 10 ml of PBS and the resuspended in 3 ml of 5 % trichloroacetic acid (TCA). Cells were allowed to set overnight at approximately 4°C before being resuspended in TCA, transferred into scintillation cocktail and counted in a Beta counter for 5 minutes. Raw data was collected directly from the Beta counter. The mean cpm-backgroud count for each dose group was calculated and compared to the vehicel for significance and dose response.
Positive control DNFB (2.4-Dinitrofluorobenzene)
Result: Significant increases in lymph node proliferation was detected with the LLNA at concentrations of 20 % ($p < 0.05$) and 30 % ($p < 0.01$) n-buty acrylate.
Reliability: (2) valid with restrictions
well documented study
Flag: Critical study for SIDS endpoint
31-JUL-2002 (119)

Type: Skin painting test
Species: guinea pig
Result: not sensitizing

Method: other: BASF test
GLP: no
Test substance: other TS: Butyl acrylate, no further data

Remark: 9 guinea pigs were tested.
Initiation: 23 skin paintings with undiluted and in chloroforme and ethanol diluted n-butyl acrylate.
Challenge: after 9 days break with 5 % n-butyl acrylate in chloroforme. No sensitization in any animal was observed
Reliability: (2) valid with restrictions
Flag: Critical study for SIDS endpoint
31-JUL-2002 (120)

Type: Open epicutaneous test
Species: guinea pig
Result: sensitizing

Method: Commercial grade n-butylacrylate no further information given was used in this test. Six Hartley guinea pigs received 0.1 ml of the chemical prepared in acetone/olive oil (1:1) to give a 10% concentration on the shaven skin on day 1, 2, 3, 4, 7, 8 ,9, 10, 11 under open epicutaneous conditions. Challenge was performed on day 21 with weekly

rechallenges for up to 12 weeks.

Remark: Positive reactions were reproted in 3 out of 6 animals. No information is given on control animals.

27-SEP-2001 (121)

Type: Split adjuvant test
Species: guinea pig
Result: sensitizing

Method: Commercial grade n-butylacrylate no further information given was used in this test. Six Hartley guinea pigs received 5 adjuvant (FCA) injections on day 0 of the study followed by 5 injections of 100 µg test compound in ethanol/saline (1:100) the day after. Open challenge treatment started on day 14 and was repeated weekly for up to 12 weeks. One drop (0.02 ml of a solution of the test compound in acetone:olive oil (4:1) was applied at each challenge concentration.

Result: Positive reactions were reported in all 6 animals. No information is given on control animals.

27-SEP-2001 (121)

Type: other: Freund's complete adjuvant test
Species: guinea pig

Method: Guinea pigs were sensitized in the Freund Complete Adjuvant Test. The aim of the study was to determine if acrylates such as n-butylacrylate show a concomitant sensitization to the acrylate stabilized with a polymerisation inhibitor or the polymerisation inhibitor alone. In the case of n-butylacrylate the inhibitor was hydroquinone. At a specified concentration of 0.1 g/kg and an analytical value of 0.05 g/l as determined by HPLC.

Result: In the case of n-butylacrylate there was no concomitant sensitization to the inhibitor hydroquinone or hydroquinone alone.

27-SEP-2001 (122)

Type: other: Maximisation test und Freund's complete adjuvant test
Species: guinea pig

Method: The scope of this study was to determine the cross sensitization pattern of acrylates including n-butylacrylat. The test was performed on animals already sensitized to n-butylacrylate either in the Guinea Pig Maximisation Test or the FCA Test (Zitat 137 aufnehmen)

14 days after the last challenge treatment, cross sensitization was tested by applying a series of acrylates to defined areas of the skin (volume: 0.025 ml in a area of 2 cm2). A second cross sensitizing challenge under similar conditions was performed 14 days later. The concentrations of n-butylacrylate used were 3M (21%) in the FCA test and 0.1M (1.4%) in the GPMT test.

Remark: Animals sensitized to n-Butylacrylate reacted to several acrylates and diacrylates, and dimethacrylates, cross reaction to methacrylates however were not seen. On the other hand animals animals sensitized to other acrylates/methacrylates showed also positive responses (cross reaction) to n-butylacrylate.

29-JUL-2002 (123)

Type: other: Polak-Test
Species: guinea pig
Result: sensitizing

Method: Commercial grade n-butylacrylate no further information given was used in this test. Eleven Hartley guinea pigs received 4 footpad injections of 0.1 ml of an emulsion containing 2mg/ml of the test substance in ethanol/saline (1:4) in Freund's complete adjuvant. In addition 0.1 ml of this emulsion was injected into the nape of the neck. All together each animal received 1 mg of the test substance. Challenge started on day 7 of the study. One drop (0.02 ml of a solution of the test compound in acetone:olive oil (4:1) was applied at each challenge concentration. Rechallenge experiments were repeated each week for up to 12 weeks using different sites of the skin.
Result: Positive reactions were reported already at 7 days (1st challenge) when skin test concentrations were ranging from 0.5 to 5%. The results are not given by the number of positive animals but as average intensity of skin reactions of all animals. In this case they ranged from 0.3 (lowest test concentration) to 1.7 (highest test concentration).No information is given on control animals. A definitive evaluation is impaired by the sparse information given in the publication.
27-SEP-2001 (121)

5.4 Repeated Dose Toxicity

Type: Sub-chronic
Species: rat **Sex:** male/female
Strain: Sprague-Dawley
Route of administration: inhalation
Exposure period: 13 weeks
Frequency of treatment: 6 h/day, 5 d/week for 13 weeks (63 exposures)
Post exposure period: 16 hours
Doses: 0, 21, 108, 211, and 546 ppm (0; 0.11; 0.57; 1.12; 2.90 mg/l/day)
Control Group: yes, concurrent vehicle
NOAEL: = 108 ppm
LOAEL: = 211 ppm

Method: other
Year: 1978
GLP: no
Test substance: other TS: n-butyl acrylate, purity 99.5 %

Method: n-butyl acrylate was offered to rats (20 male and female rats per dose and control group) for inhalation over a period of 13 weeks at concentrations (analytically measured) of 21, 108, 211, and 546 ppm. (nominal concentrations were 20; 100; 200 and 550 ppm)
Body weight was checked once a week (Mondays).
Behavior and appearance of the test animals was checked daily. Lethality was checked daily. Animals were supplied with food and water ad libitum except during exposure times.
Remark: For the statistical evaluation of the study, means, standard deviations (of the individual values) and standard errors were calculated for the variables body weight change and absolute

and relative organ weights for the animals in each test group and collated in the form of tables togehter with the individual values.
Statistical significance was determined by a t-test generalized by Williams (Biometrics 27, 103.117, 1971, Biometrics 28, 519-531, 1972) for the simultaneous comparison of several dose groups with a control group.

Result: No animal of test groups 21, 108, and 211 ppm died during the total study period. 31 of 40 animals (77 %) in the 546 ppm group died.

At concentrations of 21 and 108 ppm, the test substance was tolerated by the animals without any signs.
At 211 ppm the test substance caused irritations of the eyes and of the mucosa of the nose during exposure.
At 546 ppm, the animals exhibited signs of toxicity (hemorrhagic discharge from the eyes and noses, severe dyspnea) that became constantly more severe.
In some animals (21, 108, and 546 ppm) diffuse alopecia was observed.
A reduced body weight change of the animals exposed is to be regarded as treatment relevant. As of 211 ppm it is significant and dose-dependent. A similar trend can still be observed at 108 ppm. In the male animals it is slightly stronger than in the female ones. (body weight males: 393.3, 399; 375; 340.8; 251 g; body weight females: 231.3; 230.1; 227.65; 222.6; 200.8 g in the 0, 21, 108, 211 and 546 ppm groups)

In clinico-chemical and hematological values of the highes dose group reveal a substance-induced influence in the case of the following parameters: sodium, potassium, glucose, cholesterol, alkaline phosphate, hemoglobin, erythrocytes, polymorphonuclears, lymphocytes, monocytes and some blood anomalies. It must be emphasized as a reservation that these changes that these changes occured only in some animals of one sex. No clearly substance-induced changes could be detected at the lower concentrations, with the exception of the potassium and alkaline phosphatase activity values of the female animals in the 211 ppm group. No adverse effects of the test substance could be seen from the urinary findings.

In females an increase in the relative liver weights could be noted. Only in the highest dose group the relative lung weight was increased.

In the 21- to 211-ppm dose groups, neither the gross-pathological nor histopathological examinations revealed changes that indicate an adverse effect of the test substance. The animals of the 546 ppm group died during exposure, this being mainly due to the strong irritation of the test substance on the respiratory tract. Metaplasia of the respiratory epithelium as far as the terminal bronchioles and proliferation of the bronchoalveolar epithelium could also be detected.

Gross-pathological findings:
In gross examination, lesions were detected mainly in the 16 male animals that died intercurrently between days 17 and 69, and in the 15 female animals in the 546 ppm group that died

between days 24 and 90.
Raised foci of bronchopneumonia of about the size of a rice grain with sporadic whitish-gray or darkred spots were found across all the lobes of the lungs; in some animals a discharge from the bronchi could be seen on the plane of the section, other foci had, in parts, a compact appearance and ressembled lard. In a few animals, fibrinous pleuritis was also to be seen.
The nutritional state of these rats was poor. Many of them had advanced autolysis.
Essentially, the animals of this group (4 males and 5 females) and of the 211, 108, 21 and 0 ppm groups that survived until the end of the study showed pneumonic zones that were randomly distributed among various lobes, and a few female animals showed hydrometra.

Histopathological findings:

546 ppm:
Histopathological changes were found mostly in the respiratory tract of the animals in the 546 ppm group that died intercurrently.
In the male and female rats slight hyperemia of the nasal mucosa, edema and dysplasia of the epithelial mucosa could be seen. In one female animal pronounced purulent rhinitis was noted. Hyperemia and edema were found also in the trachea in almost all males that died spontaneously and that were examined in this group; they were seen in only half of the females.
Metaplasia of the mucosa (multi-rowed, cornified epithelium) was detected in most of the rats and predominantly in males. One single animal even had necrosis of the mucosa.
Metaplasia was found as far as the bronchioles and ws observed in both sexes. In many animals multi-focal infiltration with various degrees of extension emerged from metaplasia on the one hand and from proliferation in the alveolar zone on the other. It consisted of metaplastic epithelial cells still containing mucin and dark-nuclear cells (some of them mononuclear) and which had to be distinguished from the usal rat-specific infiltrates. Multifocal infiltraion, which was found in the females in a greater number than in males, changed into bronchopneumonia in nearly the same number of male and female animals. Gram-positive germs could be detected in the aera of the pneumonic foci in animals which were characterized by extensive and advance necrosis of the lungs.
Male and female animals that died intercurrently were found to have hyperemia and necrosis in the liver (1 male and 1 female) together with fatty deposits predominantly in the peripheral zones of the lobules, these being more pronounced in the females. In one third of the male animals the glycogen content was slightly increased.
The spleen of two male animals of the 546 ppm group showed hyperemia, of one female moderate fibrosis and the thymus of four males and one female hemorrhages.
In the case of the bone marrow, erythropoesis prevailed in four male and three female rats and granulopoesis in four male and seven females, in some with a shift to the left.
Hyperemia of the kidneys and meninges, and a cyst in the anterior lobe (twice) was found in the animals of the 546 ppm group that died spontaneously.

other groups:
Slight edema and erosions of the nasal mucosa were found in only 2 male animals of the 211 ppm group and in one female rat of the 108 ppm group.
In female animals in the 211 ppm gorup, a slight increase in fatty deposits and the glycogen content in the liver was noted in comparison to the control group.
In nearly half of all male animals of the 211, 108 and 0 ppm groups, the fat-free vacuoles (hematoxylin eosin stain), fatty deposits, mainly in Kupffer's star cells, and increase of the glycogen content in the liver were attributed to the fact that these animals had not been fasted on the day before they were necropsied and therefore the findings are to be regarded normal.
Using the Turnbull blue reaction, a slight decrease in the hematogenic iron pigment was seen above all in the females of the 211 and 108 ppm groups when compared with the control.
No histopathological examination were carried out in the 21 ppm group.

Reliability: (2) valid with restrictions
study meets current guidelines

Flag: Critical study for SIDS endpoint

31-JUL-2002 (124)

Type: Sub-chronic
Species: rat **Sex:** male/female
Strain: other: CDF-F344
Route of administration: drinking water
Exposure period: 13 weeks
Frequency of treatment: continuously
Doses: 0; 0.015; 0.09; 0.15% in drinking water (males: ca. 0; 12; 73; 84 mg/kg bw/d; females: ca. 0; 15; 91; 111 mg/kg bw/d)
Control Group: yes, concurrent no treatment

GLP: no data
Test substance: other TS: butyl acrylate, no further data

Remark: A satelitte group of male and female rats was given 150 mg butyl acrylate / kg / day via gavage 13 weeks

Result: Groups of 15 male and 15 female rats were tested, the duration of the test was 96 - 97 days.
Adverse effects reported in the drinking water study were a slight reduction in water consumption which occurred for all the dose groups, and a decrease in the weight gain for the male rats in the highest dose group. No abnormal hematology, clinical chemistry, urinalysis, or histopathology findings were reported.

In the same study, butyl acrylate in 10 % corn oil was administered to groups of 5 male and 5 female rats by gavage, at a dosage of 150 mg/kg, 5 times a week for 96 days. Examination of the animals at study termination showed only a slight increase in relative liver weight. No other toxic effects were noted.

NOAEL:
males 84 mg/kg bw/day
females 111 mg/kg bw/day

Reliability: (4) not assignable
only published as abstract

Flag: Critical study for SIDS endpoint
31-JUL-2002 (125) (126)

Species: rat **Sex:** male
Strain: no data
Route of administration: inhalation
Exposure period: 4 months
Frequency of treatment: 24 hrs/day
Doses: 0,17; 2; 26 ppm (0,0009; 0,0108; 0,138 mg/l/day)

Remark: Details on test procedure (number of animals, control goup) as well as details on clinical, clinical-chemical, hematological and pathological results are missing.
Because of the missing data concerning test procedure and results, this study is not reliable and therefore should not be taken into account for evaluation the risk of butyl acrylate by subchronic inhalation.
Result: No signs of a serious intoxication were observed. However changes in enzyme activity were dose-related and disturbances in the pituary-adrenal gland-system, in the function of the thyroid gland and of the reflexes were noticed.
Patho-morphological changes in the blood circulatory system, dystrophy and adverse effects on inner organs were reversible after 4 weeks.
29-JUL-2002 (89)

Species: mouse **Sex:** female
Strain: no data
Route of administration: inhalation
Exposure period: 4 months
Frequency of treatment: 24 hrs/day
Doses: 0,17; 2; 26 ppm (0,0009; 0,0108; 0,138 mg/l/day)

Remark: Details on test procedure (number of animals, control goup) as well as details on clinical, clinical-chemical, hematological and pathological results are missing.
Because of the missing data concerning test procedure and results, this study is not reliable and therefore should not be taken into account for evaluation the risk of butyl acrylate by subchronic inhalation.
Result: No signs of a serious intoxication were observed. However changes in enzyme activity were dose-related and disturbances in the pituary-adrenal gland-system, in the function of the thyroid gland and of the reflexes were noticed.
Patho-morphological changes in the blood circulatory system, dystrophy and adverse effects on inner organs were reversible after 4 weeks.
29-JUL-2002 (89)

Species: rabbit **Sex:** male/female
Strain: no data
Route of administration: oral unspecified
Exposure period: 2 weeks
Frequency of treatment: 5 days/week (in total 9 applications)
Post exposure period: no
Doses: 900 mg/kg bw/day(1,0 ml/kg; gepr. als 10%ige waessr. Traganthemulsion)
Control Group: other

Method: other: BASF-Test
GLP: no

Test substance: as prescribed by 1.1 - 1.4

Result: Daily application of 1.0 ml/kg butyl acrylate for 2 weeks was endured by the animals (n=3) without any serious damage. Blood count, liver function, urine and blood urea were always in a normal range. Section revealed no pathological findings on any organ.

29-JUL-2002 (93)

5.5 Genetic Toxicity 'in Vitro'

Type: Ames test
System of testing: Salmonella typhimurium; TA98 TA100 TA1535 TA1537
Concentration: 3.15 to 1000 nl per plate (2.83, 8.98, 28.3, 89.8, 283 and 898 µg per plate)
Metabolic activation: with and without
Result: negative

Method: other: Ames, B.N. et al.: Mutation Research 31, 347-364, 1975
Year: 1977
GLP: no
Test substance: other TS: Butyl acrylate, stabalized with 15 ppm methyletherhydroquinone, with an impurity of 0.4% butylpropionate

Result: Butyl acrylate was neither mutagenic nor cytotoxic. Based on the assumption that butyl acrylate may form an epoxide metabolite, an epoxide hydrolase inhibitor, 1,1,1-trichloropropene-2,3-oxide was used in some of the tests with strain TA98. Also under these special conditions, butyl acrylate proved to be non-mutagenic.
Test substance: purity: 99.6%; 0.4% Butylpropionate
Reliability: (2) valid with restrictions
study meets current guidelines
Flag: Critical study for SIDS endpoint

31-JUL-2002 (127)

Type: Ames test
System of testing: Salmonella typhimurium TA98 TA100 TA1535 TA1537
Concentration: up to 10 000 ug/plate
Metabolic activation: with and without
Result: negative

Method: other: according to Haworth et al.; Environ. Mutagen.,5 (Suppl.1), 3-142, (1983)
Test substance: other TS: n-butyl acrylate

Remark: The test was performed in the Case Western Reserve University, a preincubation modification of the Salmonella test was used, the test chemical was incubated with the tester strain either in buffer or S9 plus cofactor mix, for 20 minutes at 37°C prior to the addition of soft agar and plating on minimal agar plates.
It was tested both in the absence of metabolic activation and with exogenous metabolic activation (S9) from Aroclor 1254 - induced Sprague Dawley rats and Syrian hamsters.

Test concentrations:
33; 100; 333; 1000; 3333 and 10 000 µg/plate.

Cytotoxic effects:
In TA1535 and TA98 tested without S9, concentration of 333 µg/plate and higher were toxic; in TA1537 tested without S9, concentration of 1000 µg/plate and higher were toxic.
Reliability: (2) valid with restrictions
well documented study
Flag: Critical study for SIDS endpoint
31-JUL-2002 (128)

Type: Cytogenetic assay
System of testing: Syrian hamster embryo fibroblasts (SHE-cells)
Concentration: 0.5 - 10 µg/ml
Metabolic activation: without
Result: negative

Method: other
GLP: no data
Test substance: other TS: n-butyl acrylate, (Huels AG, Marl)

Method: Tertiary cultures (1.5 x 10E5 cells) were incubated for 24 h at 37° C in a humified atmosphere in 12 % CO2 in air. The cultures were treated with various concentrations (0.5 - 10 ug/ml) of the test compound (solvent: DMSO). After an incubation time of 5 h the compound was removed by medium change. After further incubation for 18 h cells were fixed, stained and scored for micronuclei. Only structures smaller than one third of the nucleus were counted in order to avoid confusion with dividing cells. For each concentration the number of cell containing single and multiple mirconuclei was determined among a population of 2000 cells.
Diethylstibestrol served as positive control.
Result: n-Butyl acrylate did not induce micronuclei in SHE-cells.
Reliability: (2) valid with restrictions
well documented publication
Flag: Critical study for SIDS endpoint
31-JUL-2002 (129)

Type: Cytogenetic assay
System of testing: Chinese Hamster Ovary Cells
Concentration: see remark
Cytotoxic Concentration: see remark
Metabolic activation: with and without

Method: other
GLP: no data
Test substance: other TS: n-butyl acrylate

Method: Without S9, the test substance was incubated with the cells in McCoy's 5A medium for 8 hours followed by a 2 hour incubation with colcemid. The cells were then harvested, fixed and stained with Giemsa.
For the assay with S9, the cells were treated with the substance and S9 for 2 hours. The treatment mixture was removed and the cells were then incubated for 10 hours, with colcemid present for 2 hours. The cells were harvested in the same manner as for the treatment without S9. If significant cell cylcle delay was seen in either procedure, the cells could be incubated longer prior to addition of colcemid.
Remark: n-butyl acrylate was tested in different trails without metabolic activation in the concentrations of:

5; 7.5; 10.1; 17.1; 25.2; 32.2; 37.7, 40.3 µg/ml.
concentrations of 10.1 µg/ml and higher showed a cytotoxic effect.
With metabolic activation following concentrations were tested:
66; 132; 150, 200, 250, 267; 300, 398 µg/ml.
Vehicle: DMSO

Result: negative; only in trails without S9 addition and in concentrations where high cytotoxicity occurred (only 5-50% of cells could be evaluated) a significant increase of aberrant cells was observed.
The observed cytogenetic effect is propably due to the cytotoxicity. With metabolic activation no increase of chromsome aberrations was observed in any concentration tested.

Reliability: (2) valid with restrictions
well documented study

Flag: Critical study for SIDS endpoint

31-JUL-2002 (130) (131) (132)

Type: Unscheduled DNA synthesis
System of testing: Syrian hamster embryo fibroblasts (SHE-cells)
Concentration: 1 - 400 ug/ml
Metabolic activation: without
Result: negative

Method: other
GLP: no data
Test substance: other TS: n-butyl acrylate, (Huels AG, Marl)

Method: according to:
Schiffermann D. et al., Canc. Lett., 23, 297-305, (1984) and Tsutsui T. et al.: Cancer Res., 44. 184-189,(1984)

Tertiary cultures (1.7 x 10E5 cells) were incubated with arginine-free medium (including 2.5 % fetal bovine serum) for 48 h. After change of medium 3H-thymidine and 10 mM hydroxyurea were added and the cultures were incubated with various concentrations (1 - 400 µg/ml) of the test compound (solvent: DMSO). After an incubation time of 5 h the cells were washed (phosphate-buffered saline) and solubilized (2 % SDS). Subsequently the cells were precipitated (20 % trichloroacetic acid) and the precipitate was washed with ethanol. Subsequently the precipitate was incubated with tissue solubilizer (6 h, 50°C) and measurement of radioactivity (liquid scintillation) was carried out.

Result: Butyl acrylate did not induce unscheduled DNA synthesis in SHE cells.

Reliability: (2) valid with restrictions
well documented publication

Flag: Critical study for SIDS endpoint

31-JUL-2002 (133)

Type: other: Cell transformation assay
System of testing: Syrian hamster embryo fibroblasts (SHE-cells)
Concentration: 5 - 15 µg/l
Cytotoxic Concentration: 15 µg/l
Metabolic activation: without
Result: negative

Method: other

GLP: no data
Test substance: other TS: n-butyl acrylate, (Huels AG, Marl)

Method: according to:
Schiffermann D. et al.: Cancer Lett., 23, 297-305, (1984)

Target cells (150 - 200 cells) were seeded on a layer of 2 x 10E4 lethally irradiated homologous feeder cells in complete medium in 60 mm tissue culture petri dishes. After 24 h, the test compound were dissolved in DMSO and added to the culture medium. The final concentraion of DMSO in the incubation mixture did not exceed 0.1 % (v/v). Following a 48 h incubation in the dark in a humidified incubator with 10 % CO2 at 37°C, cells were washed with PBS and fed with fresh culture medium. Eight days later, the cells were fixed in absolute methanol, stained with 10 % aqueous Giemsa and scored for cloning efficiency and morphological transformation according to criteria described previously in detail (Pienta R.J., Chem. Mutagens. Principles and methods for their detection, Vol. 6, 175-202, (1980)).
Result: No morphological transformation was observed.
Reliability: (2) valid with restrictions
well documented publication
Flag: Critical study for SIDS endpoint
31-JUL-2002 (133)

Type: Ames test
System of testing: Salmonella typhimurium
Concentration: 30 to 2000 ng/plate
Metabolic activation: with and without
Result: negative

Method: other
Year: 1984
GLP: no
Test substance: as prescribed by 1.1 - 1.4

Method: An Ames test was conducted with butyl acrylate using strains TA1535, TA1537, TA1538, TA98, and TA100. All strains were exposed to concentrations ranging from 30 to 2000 ng/plate with and without S9 preparations. Both Arochlor 1254 induced S9 mix from rat liver and phenobarbital induced S9 mix from arat liver were used.
Result: Butyl acrylate did not induce point mutations in this study. Futher, buyl acrylate was not mutagenic in a modified suspension assay in TA100 using concentrations of 15, 150, and 1500 ng/2 ml. The National Toxicology Program (NTP) reported butyl acrylate to be nonmutagenic in Salmonella strains.
11-AUG-1999 (134)

Type: Ames test
System of testing: Salmonella typhimurium TA1535 TA1537 TA1538 TA98 TA100
Metabolic activation: with and without
Result: negative

Remark: S-9. Additionally a modified liquid suspension assay was carrie out on TA100. Likewise, the substance showed no mutagenic potential in this test system.
29-JUL-2002 (135)

Type: Sister chromatid exchange assay
System of testing: Chinese Hamster Ovary Cells

GLP: no data

Remark: Butyl acrylate was reported to induce small increases in the frequency of sister chromatid exchanges following treatment of Chinese Hamster Ovary Cells. The increases were generally less than twice the concurrent control values and the biological significance of such increases is therefore questionable.
Reliability: (2) valid with restrictions
well documented study
27-MAY-2002 (130) (131) (132)

5.6 Genetic Toxicity 'in Vivo'

Type: Cytogenetic assay
Species: rat **Sex:** male/female
Strain: Sprague-Dawley
Route of admin.: inhalation
Exposure period: 6 hours/day for 4 days
Doses: 820 ppm
Result: negative

Method: other: OECD 475; and the method of Schmid and Staiger (1969).
Year: 1983
GLP: no
Test substance: as prescribed by 1.1 - 1.4

Method: TEST ANIMAL: Male and female Sprague-Dawley Rats (10 weeks old) weighing 216 grams (SPF, WIGA).

TEST COMPOUND CONCENTRATIONS USED: Route of administration was inhalation; n-Butyl acrylate was administered at 820 ppm; 6 hrs/day for the first three days and 5 hrs for the 4th day.

CONTROL MATERIALS: Control animals were exposed to fresh air; Positive Control: Colcemid given via intraperitoneal injection at 3.3 mg/k.g

TEST PERFORMANCE: A continuous infusion piston pump delivered a constant amount of n-Butyl acrylate (14.4 ml/hr) to a heated (100 degree C) glass evaporator. The n-butyl acrylate vapors were diluted with dust-free conditioned air (3200 l/hr; temperature =22 degrees C; humidity - 55 %) to deliver the desired concentration of test material to the test animals. The exposure chamber was 200 L. The concentration of n-butyl acrylate was measured analytically by continuous monitoring with a calbrated total hydrocarbon analyzer. Control animals received fresh air only.
Animals were housed in wire mesh cages and separated by sex, 2-3 animals/cage. Animals were pre-conditioned for 3-5 days, after which they were exposed as described above. Three hours after the last exposure the animals were injected with 3.3. mg/kg of colcemid in order to arrest mitosis in the metaphase. Two hours after the colcemid injection the

animals were sacrificed and bone marrow prepared according to the method of Schmid and Staiger (1969). One hundred metaphases were analyzed per animal.

STATISTICAL EVALUATION: Statistical evaluations followed the Fisher's exact test and the Mann-Whitney asymptotic U test. Both were conducted at 95% and 99%.

Result: REPORT RESULTS: There were clear signs of toxicity including: dysnpea, bloody discharge from eyes and nose, and death.

There were 10 male and 10 females dosed, and the following number of animals analyzed: 6/6 and 8/8 rats at 0 and 820 ppm. 100 metaphases per animal counted (including breaks, fragments and exchanges); and the mitotic index (%) M/F was : 4.12/3.98 (0 ppm) and 3.16/3.43 (820 ppm).

Analysis of the results demonstrates there was no increase in the rate of chromosome aberrations in males or females.

CONCLUSION: The test material was negative in the bone marrow cytogenetic assay for chromosome aberrations in Sprague-Dawley Rats.

Test substance: purity: 95.5%

Reliability: (1) valid without restriction
DATA QUALITY: Study was conducted in accordance with a recognized scientific procedure for determining the adverse effects of a test substance in an In Vivo Cytogenetic Assay for Chromosome Aberrations, following GLP regulations. The test animals were properly exposed to colcemid prior to sacrifice in order the arrest mitosis in metaphase. The study meets national and international scientific standards and provides sufficient information to support the conclusions regarding the absence of mutagenic activity in this assay.

Flag: Critical study for SIDS endpoint

31-JUL-2002 (136)

Type: Cytogenetic assay
Species: Chinese hamster **Sex:** male/female
Route of admin.: inhalation
Exposure period: 6 hours/day for 4 days
Doses: 817 ppm
Result: negative

Method: other: OECD 475; and the method of Schmid and Staiger (1969).
GLP: no
Test substance: as prescribed by 1.1 - 1.4

Method: TEST ANIMAL: Male and female Chinese Hamsters (18 weeks old), weighing 32 grams

TEST COMPOUND CONCENTRATIONS USED: Route of administration was inhalation; n-Butyl acrylate was administered at 817 ppm; 6 hrs/day for the first three days and 5 hrs for the 4th day.

CONTROL MATERIALS: Control animals were exposed to fresh air; Positive Control: Colcemid given via intraperitoneal injection at 3.3 mg/k.g

TEST PERFORMANCE: A continuous infusion piston pump delivered a constant amount of n-Butyl acrylate (14.4 ml/hr) to a heated (100 degree C) glass evaporator. The n-butyl acrylate vapors were diluted with dust-free conditioned air (3200 l/hr; temperature =22 degrees C; humidity - 55 %) to deliver the desired concentration of test material to the test animals. The exposure chamber was 200 L. The concentration of n-butyl acrylate was measured analytically by continuous monitoring with a calbrated total hydrocarbon analyzer. Control animals received fresh air only.
Animals were housed in wire mesh cages and separated by sex, 2-3 animals/cage. Animals were pre-conditioned for 3-5 days, after which they were exposed as described above. Three hours after the last exposure the animals were injected with 3.3. mg/kg of colcemid in order to arrest mitosis in the metaphase. Two hours after the colcemid injection the animals were sacrificed and bone marrow prepared according to the method of Schmid and Staiger (1969). One hundred metaphases were analyzed per animal.

STATISTICAL EVALUATION: Statistical evaluations followed the Fisher's exact test and the Mann-Whitney asymptotic U test. Both were conducted at 95% and 99%.

Result: REPORT RESULTS: There were clear signs of toxicity including: dysnpea, bloody discharge from eyes and nose, and death.

There were 10 male and 10 females dosed, and the following number of animals analyzed: 9/9 and 5/8 hamsters (4 male

animals died) at 0 and 817 ppm.
100 metaphases per animal counted (including breaks, fragments and exchanges); and the mitotic index (%) male/female was for hamster: 3.17/2.97 (0 ppm) and 2.2/2.79 (817 ppm)

Analysis of the results demonstrates there was no increase in the rate of chromosome aberrations in males or females.

CONCLUSION: The test material was negative in the bone marrow cytogenetic assay for chromosome aberrations in Chinese Hamsters.

Test substance: purity: 99.5%

Reliability: (1) valid without restriction
DATA QUALITY: Study was conducted in accordance with a recognized scientific procedure for determining the adverse effects of a test substance in an In Vivo Cytogenetic Assay for Chromosome Aberrations, following GLP regulations. The test animals were properly exposed to colcemid prior to sacrifice in order the arrest mitosis in metaphase. The study meets national and international scientific standards and provides sufficient information to support the conclusions regarding the absence of mutagenic activity in this assay.

Flag: Critical study for SIDS endpoint

31-JUL-2002 (137)

5.7 Carcinogenicity

Species: rat **Sex:** male/female
Strain: Sprague-Dawley
Route of administration: inhalation
Exposure period: 2 years
Frequency of treatment: 6 hr/day, 5 days/week, for 24 months. Exposure was whole body
Post exposure period: 6 months
Doses: 0, 15, 45 and 135 ppm (0; 0.086; 0.258; 0.773 mg/l)
Result: negative
Control Group: yes, concurrent vehicle

Method: OECD Guide-line 453 "Combined Chronic Toxicity/Carcinogenicity Studies"
GLP: yes
Test substance: other TS: : n-Butyl acrylate; >99.5% purity; impurities: butyl propionate and isobutyl acrylate; stability determined.

Method: SPECIES/SEX: Male/female Sprague-Dawley Rats (WIGA); weighing 183 grams (Males) and 157 grams (Females).

AGE at Start of Test: 35 days old

ROUTE: Inhalation; 6 hr/day, 5 days/week, for 24 months.

Exposure was whole body.

DOSE LEVEL(S) and NUMBER OF DOSES: Initially during the first 13 weeks, the dose levels were: 0, 5, 15 and 45 ppm. After 13 weeks the doses were increased to: 0, 15, 45, and 135 ppm.

NUMBER OF ANIMALS/DOSE: 86M/86F per dose, housed 5/cage.

VEHICLE: Fresh air.

EXPOSURE CHAMBER and ANALYSIS: Vapors of the test material were generated from the liquid form, introduced at a constant flow into heated evaporators (approx. 120 degrees C) through which a constant flow of air was metered (0.3-3 m3/hr). The inhalation chambers were stainless steel, approximately 4.9 m3. Fresh air was mixed with the test chemical vapors to achieve the desired concentration. Both nominal and measured concentrations of test material were determined throughout the study. Test concentrations were measured during each daily exposure period (for 10 minutes) and the vapors analyzed by GC to confirm purity.

CAGESIDE OBSERVATIONS: All animals were observed before and after each daily exposure for general condition and signs of toxicity, and once during the post-exposure observation period. Animals found dead or moribund were removed and autopsied.

BODY WEIGHT MEASUREMENTS: Measured prior to first dose, then weekly throughout study, and at termination.

FOOD CONSUMPTION/FOOD EFFICIENCY: Food consumption was

measured weekly.

HEMATOLOGY: Blood was collected from the orbital sinus of all rats at necropsy and erythrocyte and leukocyte counts determined. Also, all scheduled interim sacrifice animals in control and high dose groups (12 and 18 months) were examined for reticulocyte, normoblast, and differential leukocyte counts, Heinz bodies, packed cell volume, erythrocyte volume, hemoglobin content, and hemoglobin concentration, as well as erythrocyte and leukocyte counts. Bone marrow smears were prepared from rats in these groups as well as all moribund rats.

URINALYSIS: Urine, collected from all rats at necropsy, was examined for color, volume, pH, transparency, and concentration of protein, glucose, bilirubin, urobilinogen, ketone bodies, occult blood and sediment.

OPHTHALMOLOGY: Eyes were examined for external changes and pupillary reflex just prior to sacrifice. Changes in the anerior part of the bulbus and fundus were examined in mydriasis (1% atropin).

STATISTICAL METHODS: The significance of differences between dosed and control group means was assessed using two-sided fiducial limit = 0.05 as the level of significance. No correction for multiple testing was performed. Mortality was analyzed using life-table method of Armitage (1971), after accounting for non-spontaneous deaths. The Student's t-test was used to analyze body weight gain, food consumption, organ weights, and all hematological parameters. Moribund rats were excluded from routine statistics. Histological observatiosn were analyzed using contingency tables of Sokal and Rohlf (1969). Tumors were classifed as "incidental" or "fatal" and then analyzed using the two-sided chi-square method of Peto (1980). Non-parametric tests were examined using Mann-Whitney (1947) or Pfanzagl (1978).

ORGAN WEIGHTS: Absolute and relative organ weights (organ-body, and organ-brain) were measured at necropsy. All tissues with gross lesions and representative sections of organs and tissues (according to OECD Guideline 453), except for accessory sex glands, were preserved in 4% neutral formaldehyde. The testes were preserved in Bouin's fixative and the lumbar vertebrae in Schaffer's fixative.

GROSS PATHOLOGY: Full compliment of tissues were fixed and examined in all animals.

HISTOPATHOLOGY: All tissues were embedded in paraffin and stained with hematoxylin and eosin. In addition, the liver, nasal cavity, and kidney sections were stained with periodic acid-Schiff stain. Nasal cavity and lumbar vertebrae were decalcified in ultrasonic bath using nitric acid before embedding. Further, at each schedule sacrifice, 11 tissue samples from each of 10 male and female rats in control and high dose were examined.

Remark: Study was Published: Food Chemical Toxicology. Vol. 29. No. 5, 329-339 (1991).

Result: FINDINGS/MEASURED ENDPOINT/INDEX (i.e. LOAEL, NOAEL): There were no compound related effects on general behavior or

appearance; no overt signs of toxicity and no effects on mortality. All rats demonstrated a 20% cumulative mortality rate at 24 months. Body weight gain was normal in all groups, with only a slight decrease in food consumption in treated males and females. There were no compound related effects on hematological measurement or urinalysis. Organ weights were generally uneffected by treatment, except for slightly lower relative heart, kidney, liver and thyroid weights at the highest dose.

Ophthalmology examinations demonstrated localized or diffuse stippling of the corneal epithelium, cloudiness of the cornea and various degrees of vascularization that increased with dose and duration of exposure.

Incidence reported were 3,4 and 2% at 0, 15 and 45 ppm, respectively, versus 34% at 135 ppm. Based upon these findings only, there were no compound-related effects at 15 or 45 ppm, but there were signifcant compound-related changes at 135 ppm. Thus, an NOAEL for effects on the eye is 45 ppm.

Histological changes in the nasal mucosa were dose dependent; described as slight atrophy of the neurogenic part of the olfactory epithelium at 15 ppm, and partial loss of the columar cell layer and stratified reserve-cell hyperlplasia at 45 and 135 ppm. Males and females were effected in the same manner. The frequency of reserve-cell hyperplasia in nasal mucosa in rats (male and female combined) was: 0, 10, 65 and 115 at 0, 15, 45 and 135 ppm, respectively. No changes were detected in the posterior nasal cavity, and no irritative effects on the larynx, trachea or lungs. These changes are not considered neoplastic.

Based upon these findings only, there were compound-related effects at all doses administered. Thus, an NOAEL was not demonstrated for the frequency of reserve-cell hyperplasia in the nasal mucosa of male and female rats. These were classified as Level 2 changes, according to Stromberg and Hebel (1976).

Examination of tissues for neoplastic changes did not reveal any compound related increases or dose dependent effects. Comparisons to historical control evidence in the same lab, as well as heterogenous distribution across doses, supported the conclusion that there was no treatment-related carcinogenic effect of n-butyl acrylate in Sprague-Dawley rats.

Based upon an examination of the histopathological findings, it was concluded that n-Butyl Acrylate was not carcinogenic to Sprague-Dawley rats were administered via inhalation in concentrations up to 135 ppm for 24 months.

Test substance: purity: 99.8%

Reliability: (1) valid without restriction
DATA QUALITY: Study was conducted in accordance with a recognized scientific procedure for determining the chronic toxicity and oncogenicity of a test substance when administered repeatedly via inhalation for 24 months to experimental animals. Study was conducted in compliance

with GLP regulations. The study meets national and international scientific standards (OECD 453) and provides sufficient information to support the conclusions regarding the NOAEL and the LOAEL demonstrated from the study data.

Flag: Critical study for SIDS endpoint
31-JUL-2002 (138)

Species: mouse **Sex:** male
Strain: other: C3H/HeJ
Route of administration: dermal
Exposure period: life-long
Frequency of treatment: 3 days/week
Post exposure period: -
Doses: 25 ul of a 1% solution in acetone (corresponding to ca. 6.6 mg/kg)
Control Group: yes, concurrent vehicle

Result: In the mice treated life-long with butyl acrylate (mean surviving time: 503 days; control: 484 days) substance realted epidermal dermatoma was noticed.
Likewise the number of systemic tumor was not increased when compared to control. The fibrosarcoma observed on the shoulder in one animal after 665 day, was not regarded as significant due to the location (not treated area) and because of the spontaneous occurrence rate of this tumor in the aceton-treated animals. The positive control (treatment with 25 ul of a 0.1% solution 3-Methylcholanthren in aceton) revealed 39 dermatoma, from which 33 were recognized histologically as squamous cell carzinoma.
The mice treated with butyl acrylate revealed neither skin irritations nor an increased mortality rate when compared to the aceton treated animals.
29-JUL-2002 (139)

5.8.1 Toxicity to Fertility

Type: other
Species: rat
Sex: male/female
Strain: Sprague-Dawley
Route of administration: inhalation
Exposure Period: 13 weeks
Frequency of treatment: 6 h/day, 5 d/week for 13 weeks (63 exposures)
Duration of test: 13 weeks
Doses: 0, 21, 108, 211, and 546 ppm (0; 0.11; 0.57; 1.12; 2.90 mg/l/day)
Control Group: yes, concurrent vehicle

Method: other
Year: 1978
GLP: no
Test substance: other TS: n-butyl acrylate, purity 99.5 %

Method: n-Butyl acrylate was offered to rats for inhalation over a period of 13 weeks at concentrations of 21, 108, 211, and 546 ppm. Body weight was checked once a week (Mondays). Behavior and appearance of the test animals was checked daily. Lethality was checked daily. Animals were supplied with food and water ad libitum except during exposure times.

After necropsies were performed, the testes were weighed. An histopathology was conducted on the seminal vesicles, prostate, epididymis/uterus, testes and ovary.

Remark: For the statistical evaluation of the study, means, standard deviations (of the individual values) and standard errors were calculated for the variables body weight change and absolute and relative organ weights for the animals in each test group and collated in the form of tables togehter with the individual values.
Statistical significance was determined by a t-test generalized by Williams (Biometrics 27, 103.117, 1971, Biometrics 28, 519-531, 1972) for the simultaneous comparison of several dose groups with a control group.

Result: No animal of test groups 21, 108, and 211 ppm died during the total study period. 31 of 40 animals in the 546 ppm group died. At concentrations of 21 and 108 ppm, the test substance was tolerated by the animals without any signs. A reduced body weight change of the animals exposed is to be regarded as treatment relevant. The relative testes weight increased in high dose males, but this was due to the reduced body weight gain compared to the control.

	0 ppm	21 ppm	108 ppm	208 ppm	546 pm
body weight:	383.3 g	399.0 g	375.0 g	340.8 g	251.0 g
male gonad weight:	3.10 g	3.28 g	3.23 g	3.03 g	3.19 g

rel. male gonad weight/ body weight:

0.81	0.83	0.87	0.89	1.29

No effects were found in the seminal vesicles, prostate, epididymis, uterus, testes, and ovary upon microscopic examination.

Reliability: (1) valid without restriction
Flag: Critical study for SIDS endpoint
31-JUL-2002 (124)

5.8.2 Developmental Toxicity/Teratogenicity

Species: rat **Sex:** female
Strain: Sprague-Dawley
Route of administration: inhalation
Exposure period: days 6 to 20 of gestation
Frequency of treatment: 6 hours/day
Duration of test: 20 days
Doses: 100, 200, 300 ppm (0.53; 1.06; 1.6 mg/l/day)
Control Group: yes, concurrent vehicle
NOAEL Teratogenicity: 300 ppm
NOAEL Fetotoxicity : 100 ppm
LOAEL Maternal Toxicity : 100 ppm

Method: other
Year: 1999
GLP: no data
Test substance: other TS: n-butyl acrylate, purity > 99 %

Method: Groups of 20-29 bred female rats were exposed to the compound 6 h/day on days 6 through 20 of gestation. The concentrations of butyl acrylate were 100, 200 and 300 ppm. Control animals were exposed concurrently to filtered room air in an adjacent chamber with characteristics identical to

those of the treatment groups. Food pellets and water were available ad libitum except during hours of exposure. Food consumption was measured for the intervals GD 6-13 and 13-21. Maternal body weights were recorded on GD 0, 6, 13 and 21. On GD 21, the females were euthanized with an intrapulmonary injection and the uteri were removed and weighed. The number if implantation sites, resorptions, and dead and live fetuses were recorded. Live fetuses were weighed, sexed, and examined for external anomalies including those of the oral cavity. Half of the live fetuses from each litter were fixed in Bouin's solution and examined for internal soft tissue changes. The other half were fixed in 70 % ethanol, eviscerated, and than processed for skeletal staining with Alizarin Red S for skeletal examinations.

Remark:

conc. (ppm)	maternal bw GD 6 (g)	absolute weight gain (g)
0	294 +/- 23	32 +/- 15
100	289 +/- 23	18 +/- 14
200	299 +/- 24	- 16 +/- 20
300	292 +/- 23	- 60 +/- 26

Statistical analysis:
The number of implantation sites and live fetuses and the various body weights were analyzed by one-way analysis of variance (ANOVA) followed by Dunnett's test if differences were found. The percentage of non-live implants and resorptions and the proportions of fetuses with alterations in each litter were evaluated by using the Krusal-Wallis test, followed by the Dixon-Massey test where appropriate. Rates of pregnancy, fetal sex ratio, and percentages of litters with malformations or external, visceral or skeletal variations were analyzed by using Fisher's test.
Published in: Toxicological Sciences. Vol. 48: 240-54. 1999.
reproductive parameters:

conc. (ppm)	litter	implantation site/litter	nonlive implants/ litter	live fetuses/ litter
0	25	15.68 +/- 3.17	10.9 +/- 15.49	14.12 +/- 4.01
100	24	15.58 +/- 3.05	6.82 +/- 10.19	14.71 +/- 3.57
200	24	15.08 +/- 4.23	4.72 +/- 5.96	14.46 +/- 4.20
300	25	15.40 +/- 5.24	6.48 +/- 15.94	14.68 +/- 5.38

Result: All female rats survived the test. The average maternal body weight gain (gd 6 - 21) was 141, 128, 84 and 18 g for the 0; 100, 200 and 300 ppm dose groups, respectively. These maternal weight gains were markedly lower in the 200 and 300 ppm dose groups as compared to the controls ($p < 0.01$). Absolute weight gain of dams, expressed as the day 21 body weight minus the gravid uterus weight and minus the day 6 body weight, was significantly reduced in the 100*, 200**

and 300** ppm groups, respectively (* for p<0.05; ** for p<0.01), with the absolute weight gains reported to bei 32, 18, -16 and -60 g for the 0, 100, 200 and 300 ppm groups, respectively.

A NOAEC was not observed for maternal toxicity.

No treatment-related effects were reported in terms of numbers of implanation sites, live fetuses, non-live implants or resorptions.

Fetal body weight was significantly reduced at 200 ppm (for both sexes combined and males) and at 300 ppm (both sexes combined, males and females. These decreases amounted to 7-8 % (p<0.05) and 26-28 % (p<0.01) of control values for the 200 and 300 ppm groups, respectively. A few sporadic malformations were seen in the 300 ppm and the control group. There was no evidence of treatment-related effects on the incidence of external and visceral variations. The incidence of individual skeletal variations (mainly incomplete ossification of sternebrae and of vertebral centra) was similiar in the control and treated groups.

The LOAEC for maternal toxicity was 100 ppm (0.53 mg/l/day)
The NOAEC for developmental toxicity was 100 ppm (0.53 mg/l/day).
The NOAEC for teratogenicity was 300 ppm (1.6 mg/l/day; highest dose tested).

Reliability: (1) valid without restriction
well documented publication, the study meets current guidelines

Flag: Critical study for SIDS endpoint

14-NOV-2002 (140)

Species: rat **Sex:**
Strain: Sprague-Dawley
Route of administration: inhalation
Exposure period: days 6-15 of gestation
Frequency of treatment: 6 hours per day
Duration of test: 21 days
Doses: 0, 25, 135 and 250 ppm (0, 0.13, 0.72 and 1.33 mg/l), analytical values
Control Group: yes, concurrent no treatment
NOAEL Maternal Toxity: 25 ppm
NOAEL Teratogenicity: 250 ppm
NOAEL Embryotoxicity : 25 ppm

Method: other: Guidelines for reproduction studies for safety evaluation of drugs for human use, FDA, Jan., 1966 and Guidance on reproduction studies from the Association of the British Pharmaceutical Industry, 1975
GLP: no
Test substance: other TS: Butyl acrylate, 99.91% pure

Remark:

conc. (ppm)	no pregnant/ total animals	live fetuses/ animal	resorptions (%)	weight of fetuses(g)
0	22/30	11.5 +/- 5.34	11.6	3.85 +/- 0.41
25	23/30	10.6 +/-	13.8	4.08 +/-

		4.94		0.39
135	18/30	8.8 +/- 5.14	23.6	4.09 +/- 0.23
250	19/30	8.4 +/- 5.68	31.6	4.08 +/- 0.47

Fetuses with anomalies (%) per litter were 7, 2, 4, 0 in the 0, 25, 135 and 250 ppm dose group.
Statistical evaluation:
A trend analysis based on the generalization of the t-test accroding to Williams (Biometrics 27, 103-117, 1971; Biometric 28, 519-531, 1972) was carried out for the variables of maternal body weight and body weight gain, fetal weight and length and placental weight in each case. Differences between relative frequencies were tested for significances by means of the exact test according to Fisher (Witting, Mathematische Statisik, 173-180, 1974). In detail the following variables were tested: conception rate; live fetuses per pregnant animal, dead implantations per pregnant animal; dead animals, litters with anomalous fetuses per total number of litters, litters with fetuses showing variations and retardations per total number of litters.
The U-test (Krauth Ann. Math. Statist., 42, 1949-1956,1971; Stucky and Vollmar, J. Statist. Comput. Siml., 5, 73-81, 1976) was carried out for the parameters of implantation per pregnant animal, live and dead embryos as percent per prgnant animal and anomalies, variations and retardations as percent of live fetuses per litter.
Thirty females, in which the presence of sperm was confirmed by vaginal smears, were used per dose. Animals were held to the 20th day post coitum. The inhalation of 135 and 250 ppm of the test substance caused a delay in weight gain in the females, as well as irritation to the nose and eyes. After the exposition period, these signs subsided. The same concentrations caused embryo lethality (a dose-dependent increase in the number of dead implantations).
The 25 ppm dose did not lead to any signs of maternal toxicity or embryo lethality. No signs of organ changes or skeletal abnormalities were observed in the fetuses at any concentration.

Result: Clinical examinations:
25 ppm were tolerated without any impairment of body weight. The body weight gain was significantly reduced after inhalation of 135 and 250 ppm during the period of treatment. In the period after the end of treatment (gd 16 - 20) the steepness of the body weight curve obtained after 135 and 250 ppm was similar to that of the control group. During the exposure 135 ppm led to distinct discharge from the eyes and noses and to ruffled fur. After inhalation of 250 ppm these symptoms were even more pronounced. No mortality occurred.

Necropsy findings:
The necropsy of the animals did not reveal any gross-pathological changes of the internal organs which could be attributed to the test substance.
The number of corpora lutea and the number of implantations did not show any differences between the individual groups. After inhalation of 135 and 250 ppm the percentage of live

implanations per pregnant animal was dose-dependent reduced. No adverse effect on the weight of the fetuses, their length and the placenta weights was observed. No treatment related malformations and no signs of organ changes or skeletal abnormalities were observed in the fetuses at any concentration.

NOAEC maternal toxicity: 25 ppm
NOAEC teratogenicity: 250 ppm
NOAEC embryotoxicity: 25 ppm

Test substance: purity: 99.91%
Reliability: (1) valid without restriction
study meets current guidelines
Flag: Critical study for SIDS endpoint
31-JUL-2002 (141) (142)

Species: mouse **Sex:** female
Strain: CD-1
Route of administration: gavage
Exposure period: 6.-15. Traechtigkeitstag
Frequency of treatment: taeglich
Doses: 0; 100; 1000; 1500; 2000; 2500; 3000; 4000 mg/kg in cottonseed oil
Control Group: yes
NOAEL Maternal Toxity: 100 mg/kg bw
NOAEL Teratogenicity: 2000 mg/kg bw

Result: No animal survived in the high dose group. At 3000 and 2500 mg/kg, 2 of 30 animals died, in the 2000 mg/kg dose group 1 of 29; 1 of 27 in the 1500 and 1of 30 in the 1000 mg/kg dose group died. At the 1500 mg/kg level and higher average maternal body weight gain was reduced.
Fetal body weights were reduced at doses at 1500 mg/kg and above. In the 2500 and 3000 mg/kg dose group the percentage of resorptions was significant increased.
In the control group, 100 mg/kg, 1000 mg/kg, 1500 mg/kg and 2000 mg/kg variations and malformations occurred sporadic and on different sides in a non-dose-dependent manner (i.e. cleft palate, fused ribs, fused sternebrae, fused arches, extra arches, branched ribs), with
a slight dose-dependent increase when taking the sum of all events per dose group together. In the 2500 mg/kg and 3000 mg/kg the number of fetuses with external and skeletal with malformations and variations (cleft palate, exencephaly, open eyes, fused archs, fused ribs) was significant increased.
Reliability: (2) valid with restrictions
main data is given
Flag: Critical study for SIDS endpoint
31-JUL-2002 (143)

Species: mouse **Sex:** female
Strain: CD-1
Route of administration: oral unspecified
Exposure period: gd 6 - 15
Doses: 0.1; 1, 1.5, 2; 2.5; 3 g / kg / d
Control Group: yes

Method: other
GLP: no data
Test substance: other TS: butyl acrylate, no further data

Remark: Only short table available
Result: Maternal toxicity at 1.5 g / kg /d
Increased prenatal deaths at 2.5 g / kg /d
Fetal malformations at 1 g / kg / d
Reduced fetal weight at 1.5 g /kg /d

no further information given
Reliability: (4) not assignable
10-AUG-2001 (144)

5.8.3 Toxicity to Reproduction, Other Studies

5.9 Specific Investigations

5.10 Exposure Experience

Remark: From 1955 to 1962 7 cases of skin disease in chemical workers were reported.
Reliability: (2) valid with restrictions
basic data given
Flag: Critical study for SIDS endpoint
27-SEP-2001 (145)

Remark: A 35-year-old woman with eczema on both sides of her nose after wearing spectacles with plastic nasal rests. Patch testing with butyl acrylate (1 % in pet.) was positive
Reliability: (1) valid without restriction
method and performance conform to standard
Flag: Critical study for SIDS endpoint
27-SEP-2001 (146)

Remark: Five subjects developed allergic contact dermatitis to one or more acrylate components used in a commercial adhesive tape. Patch testing to acrylic monomers was performed to examine the cross-reaction patterns. In two cases with positive reaction to 2-ethylhexyl acrylate (5 % in olive oil) also a positive reaction to N-tert. butyl maleamic acid
(1 % in pet.) was observed.
Reliability: (1) valid without restriction
method and performance conform to standard
Flag: Critical study for SIDS endpoint
27-SEP-2001 (147)

Remark: Fourteen of 33 workers exposed over an average period of five years to 50 mg/m3 butylacrylate (and 4-58 mg/m3 ethylacrylate) complained of autonomic and neurotic symptoms, but electroencephalographic examinations showed no organic dysfunction.
Reliability: (4) not assignable
4.2; only secundary literature
31-JUL-2002 (148)

Remark: An investigation of the olfactory function in 731 workers of a chemical facility which manufactures acrylates (e.g. butylacrylate) and methacrylates did not show an association of chemical exposure with olfactory test scores. A nested case-control study however, revealed an elevated crude

exposure odds ratio for cumulative effects of exposure. Odds ratio decreased with increasing duration since last exposure to the chemicals indicating that the effect may be reversible.

Reliability: (2) valid with restrictions
basic data given

Flag: Critical study for SIDS endpoint

27-SEP-2001 (149)

Remark: During 1982-1985 7 different acrylates were used for patch testing. 1 patient out of 22 was sensitized to butyl acrylate (1 % in pet.).

Reliability: (1) valid without restriction
method and performance conform to standard

Flag: Critical study for SIDS endpoint

27-SEP-2001 (150)

Remark: One out of 9 patients sensitive to acrylic resins showed a positive patch test result to butyl acrylate (0.1 % in pet.).

Reliability: (1) valid without restriction
method and performance conform to standard

Flag: Critical study for SIDS endpoint

27-SEP-2001 (151)

Remark: A 51-year-old-male developed pruriginous papulo-erythematous lesions when applying his revarnished prothesis.Patch tests showed a positive reaction to butyl acrylate (0.1 % in pet.) among other acrylates.

Reliability: (1) valid without restriction
method and performance conform to standard

Flag: Critical study for SIDS endpoint

27-SEP-2001 (152)

Remark: Two out four patients with dermatitis from working with UV-cured inks in printing plants showed a positive patch test reaction to butyl acrylate (1 % in ac.) among other acrylates.

Reliability: (1) valid without restriction
method and performance conform to standard

Flag: Critical study for SIDS endpoint

27-SEP-2001 (153)

Remark: 124 patients with a history of exposure to acrylates were patch tested with conventional patch test series. 6/124 subjects showed a positive reaction to butyl acrylate (0.1-0.5 %, wt/wt).

Reliability: (1) valid without restriction
method and performance conform to standard

Flag: Critical study for SIDS endpoint

27-SEP-2001 (154)

Remark: Between January 1987 and April 1992, 82 patients suspected of occupational acrlyic sensitization were patch tested with standard series and an extensive acrylate series, incl. butyl acrylate (1 % in pet.). In two patients positive patch test reaction butyl acrylate is reported.

Reliability: (1) valid without restriction
1.1; method and performance conform to standard

23-AUG-2001 (155)

5.11 Additional Remarks

Type: adsorption

Remark: The hydrolysis of Butyl acrylate is catalyzed by the carboxylesterase from rat liver microsomes. The kinetic of the formation of butanol is 4 times higher than the methanol formation from methylacrylate, -methacrylate, respectively.

31-JUL-2002 (156)

Type: Metabolism

Remark: Experiments with radio-labeled butyl acrylate in rats (4; 40; 400 mg/kg p.o.; 40 mg/kg i.v.) revealed, that butyl acrylate is absorbed fast by the gastro-intestinal tract and becomes metabolized completely.
In erster Linie wird Butylacrylat durch eine Carboxylesterase zu Acrylsaeure und Butanol hydrolisiert und nach weiterer Metabolisierung als CO2 abgeatmet. Geringere Mengen an Butylacrylat (10%) werden nach Konjugation mit endogenem Glutathion als Mercaptursaeuren ueber den Urin ausgeschieden.

29-JUL-2002 (82)

Type: Metabolism

Remark: Methyl, ethyl and butyl acrylate were hydrolyzed to acrylic acid in rat liver, kidney and lung homogenates. The rates of hydrolysis of the various esters in these in vitro studies were comparable; hydrolysis rates were approximately 20 times higher in liver homogenates than in kidney or lung homogenates. The esters also disappeared rapidly when added to blood in vitro. However, the disappearance in blood was not associated with the appearance of acrylic acid. The disppearance of the acrylate esters in blood in vitro could be due at least in part to binding with non-protein sulfhydryls in red blood cells rather than hydrolysis.

31-JUL-2002 (157)

Type: Metabolism

Remark: The in vitro activity of carboxylesterase recovered from the nasal mucosal tissue of B6C3F1/CrlBR mice toward several agents known to cause olfactory epithelial lesions when inhaled by rodents was determined. Apparent Vmax and Km values were obtained for mouse nasal carboxlylesterase using methyl acrylate (MA), ethyl acrylate (EA) and butyl acrylate (BA). The short-chained acrylate ester MA and EA were hydrolyzed to a greater extent than BA at enzyme-saturating levels; however the reverse was true at subsaturating levels as indicated by the relatively high Vmax/Km ratio obtained for BA. MA and BA were observed to cause a loss of carboxylesterase activity at enzyme saturation levels while EA caused a loss of enzyme activity at only one-half Km concentration. The specific activity of nasal carboxylesterase was found to be equivalent to that of the liver and greater than that of the kidney, lung

or blood. Mice and dogs were found to have similar nasal carboxylesterase activities which were slightly higher than that found in rats and about six-fold higher than that found in rabbits. These data suggest that extensive hydrolysis of acrylate esters occurs in the nasal mucosa of animals exposed to these materials. This hydrolysis may result in the production of acidic metabolites capable of causing lesions ot the nasal olfactory epithelium.

31-JUL-2002 (158)

Type: Metabolism

Remark: The metabolism of n-butyl acrylate (BA) was investigated in laboratory animals (rat, mouse, guinea pig, rabbit) and in man. The kinetics of BA elimination in blood and liver was studied by head space analysis and enzymatic tests in vitro using diluted samples of blood, plasma, erythrocytees. liver, cytosol, and microsomes. Int the blood of the rodents, BA was metbolized with half life times (t1/2) of 3.7 (rat), 4.3 (mouse), 1.6 (rabbit) and 2.3 min. (guinea pig). However in human blood t1/2 of BA was 37.6 min. Further analysis revealed that in rodent plasma BA was rapidly hydrolyzed by alkyl ester specific carboxylesterases (t1/2 between 2.0 and 13.4 min.), whereas in human plasma these enzymes were missing. Only a minor hydrolyzing activity was observed due to butyryl cholinesterase.
In the liver, all species exhibited a high carboxylesterase activity corroborating published data on the rapid hydrolysis of acrylate esters in the liver.

31-JUL-2002 (159)

Type: Toxicokinetics

Remark: Acute i.p. administration of butyl acrylate and butyl methacrylate led to their quick absorption and accumulation in the organ in the order: liver, kidney, blood, heart, brain. Incubation with gluthathion showed its direct interaction only with butyl acrylate.

Only short english abstact of the russian publication available.

23-OCT-1995 (160)

Type: other: Review

Remark: Zusammenfassende Darstellungen

31-JUL-2002 (161) (162) (163) (164) (165) (166) (167) (168) (169) (170) (171) (172) (173) (174)

6.1 Analytical Methods

6.2 Detection and Identification

7.1 Function

7.2 Effects on Organisms to be Controlled

7.3 Organisms to be Protected

7.4 User

7.5 Resistance

8.1 Methods Handling and Storing

8.2 Fire Guidance

8.3 Emergency Measures

Type: accidental spillage

Remark: Collect for disposal.

Personal Precautions: Wear suitable protective equipment. Avoid contact with liquid and vapors.

Environmental Precautions: Avoid runoff to waterways and sewers.

10-AUG-1999 (2)

Type: injury to persons (skin)

Remark: Immediately remove contaminated clothing and shoes. Wash skin with soap and water. Obtain medical attention. Wash clothing before reuse. Discard contaminated leather articles such as shoes and belt.

10-AUG-1999 (2)

Type: injury to persons (eye)

Remark: Immediately flush eyes with water and continue washing for several minutes. Remove contact lenses, if worn. Obtain medical attention.

10-AUG-1999 (2)

Type: injury to persons (oral)

Remark: If patient is fully conscious, give two glasses of milk or water at once. DO NOT INDUCE VOMITING. Obtain medical attention without delay.

10-AUG-1999 (2)

Type: injury to persons (inhalation)

Remark: Remove to fresh air. Give artificial respiration if not breathing. If breathing is difficult, oxygen may be given by qualified personnel. Obtain medical attention.

10-AUG-1999 (2)

Type: other: Notes to physician

Remark: There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.

10-AUG-1999 (2)

8.4 Possib. of Rendering Subst. Harmless

8.5 Waste Management

8.6 Side-effects Detection

8.7 Substance Registered as Dangerous for Ground Water

8.8 Reactivity Towards Container Material

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