FOREWORD INTRODUCITON

2-Hydroxyethyl methacrylate

CAS N°: 868-77-9

SIDS Initial Assessment Report

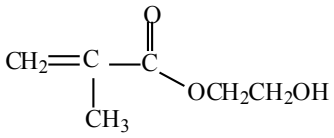
For

SIAM 13

Bern, Switzerland, 6-9 November 2001

1. Chemical Name:	2-Hydroxyethyl methacrylate
2. CAS Number:	868-77-9
3. Sponsor Country:	Japan National SIDS Contact Point in Sponsor Country: Mr. Yasuhisa Kawamura, Ministry of Foreign Affairs, Japan
4. Shared Partnership with:	
5. Roles/Responsibilities of the Partners:	
• Name of industry sponsor /consortium	ICCA Initiative work led by Mitsubishi Rayon Co., Ltd., Japan
• Process used	
6. Sponsorship History	
• How was the chemical or category brought into the OECD HPV Chemicals Programme ?	The original IUCLID documents were prepared by European Commission. Mitsubishi Rayon Co. Ltd., Japan reviewed the documents after incorporation of Japanese testing results.
7. Review Process Prior to the SIAM:	
8. Quality check process:	
9. Date of Submission:	
10. Date of last Update:	
11. Comments:	

SIDS INITIAL ASSESSMENT PROFILE

CAS No.	868-77-9
Chemical Name	2-hydroxyethyl methacrylate
Structural Formula	

RECOMMENDATIONS

The chemical is currently of low priority for further work.

SUMMARY CONCLUSIONS OF THE SIAR

Human Health

The acute toxicity of hydroxyethylmethacrylate (HEMA) is low (Oral LD50 > 4000 mg/kg; Dermal LD50 > 3000 mg/kg). HEMA is not more than slightly irritating to skin, and moderately irritating to eyes. HEMA is hydrolyzed to methacrylic acid and ethylene glycol. While other acrylates and methacrylates have been shown to cause nasal lesions on inhalation after hydrolysis to Methacrylic Acid (MAA) (discussed in SIAM 11), this effect has not been observed for HEMA.

The effects of repeated oral administration to CRJ CD(SD) rats of HEMA were shown in a combined repeat dose developmental reproductive screening assay (OECD TG 422) at concentrations of 30, 100, 300, and 1000 mg/kg/day. In males, systemic toxicity was seen only at the highest dose level, 1000 mg/kg/day, after 49 day of treatment. These signs included salivation, suppression of body weight gain, decreased feed consumption, increased relative liver weights, decreased triglycerides and increased K, Cl, or inorganic phosphorous. Relative kidney weights were increased at 100 mg/kg/day or higher. Findings related to renal histopathology were found only at 1000 mg/kg/day, the high (limit) dose group, of mild severity. One of 12 animals in this group died.

In females, HEMA was administered from 14 day prior to mating through the 3rd day of lactation. Six of the 12 animals died in the high dose group, 1000 mg/kg/day. Agonal effects or general weakness preceded death. There was suppression of body weight gain, decreased feed consumption, increased absolute and relative kidney weights, and neutrophilic cellular infiltration in the renal papillae and medulla. Histopathologic changes included a slightly softened spinal cord of one animal of those dying. The NOAEL for repeat dose toxicity in males and females was 30 mg/kg/day. The LOAEL was 100 mg/kg/day, which showed only an increased relative kidney weight (females).

This chemical was not mutagenic in bacteria but was clastogenic and induced polyploidy in mammalian cells *in vitro*. It, however, did not induce micronuclei in rat bone marrow up to the maximum tolerated dose. Based on the weight of evidence, it could be concluded that the chemical was not genotoxic *in vivo*, as it did not induce micronuclei in bone marrow.

In the six surviving females of in the above-mentioned OECD TG 422 assay, HEMA produced no sign of reproductive or developmental toxicity up to 1000 mg/kg/day, the limit dose. Thus, the NOAEL was 1000 mg/kg/day for both reproduction (both sexes, adults) and developmental (offspring) toxicity.

Animal studies suggest HEMA is a weak skin sensitizer in guinea pigs giving variable (mixed) results depending on the protocol. Positive reactions were shown only with injection of Freund's adjuvant but not by topical application alone. Whether or not this chemical induces skin sensitization in humans is equivocal; mixed results are reported in the literature on dental clients. Based on human patch test results, HEMA has sensitizing properties and HEMA has potential for cross-reaction with other (meth)acrylates.

Environment

HEMA is readily biodegradable (OECD 301C; BOD: 92-100 % after 14 days), and has a low bioaccumulation potential based on the Log Pow (0.42). Abiotically this chemical is stable at pH 4 and 7, whereas it is hydrolyzed at pH 9 with a half-life of 10.9 days.

This chemical has been tested in a limited number of aquatic species including algae, daphnid and fish. The toxicity (growth inhibition: OECD TG 201) to algae (*Selenastrum capricornutum*) was 345 mg/L for 72 h-EC50 and 160 mg/L for 72 h-NOEC. The acute (immobility: OECD TG 202) and chronic toxicity results (reproduction: OECD TG 202) for *Daphnia magna* were 380 mg/L (48 h-EC50), 90.1 mg/L (21d-EC50), 24.1 mg/L (21d-NOEC), respectively. The acute LC50 (96 h: OECD TG 203) was 227 mg/L for fish (*Pimephales promelas*) while the prolonged toxicity (14 d: OECD TG 204) for fish (*Medaka; Oryzias latipes*) was >100 mg/L. An assessment factor of 100 was used to calculate the predicted no-effect concentration (PNEC) of 0.241 mg/L for aquatic organisms because two chronic data (daphnid and algae) were available.

Exposure

In 1999, the production volume of HEMA was reported as approximately 15,000 t/year in Japan and 42,000 t/year world-wide. HEMA is used industrially as a monomer for synthesis of polymers, and for dental prosthetics. It is also used in geotechnical grouting in construction work. Fugacity modeling (Mackay level III) predicts that HEMA released to water unlikely will migrate into other compartments. HEMA is readily biodegradable and not persistent in the water phase. On the other hand, when this chemical is released to air, it will be transported to soil and water compartment to a certain extent.

HEMA is produced in a fully-closed system and workplace exposures during production are controlled. Occupational and non-occupational inhalation exposures to HEMA are considered to be low based on its physicochemical properties (low vapour pressure) and use patterns. Occupational and environmental exposure to HEMA and environmental exposure to MAA may occur when HEMA is used in geotechnical grouting operations. The only known consumer exposure to HEMA in its monomeric form is through use in the dental profession. Low levels of residual, unpolymerized HEMA may be contained in consumer products. Migration of residual monomer from the polymer matrix in articles is expected to be low. Nevertheless, the possibility of consumer exposure cannot be excluded.

NATURE OF FURTHER WORK RECOMMENDED

This is not a priority for further work in relation to exposure assessment regarding the use of this substance as a chemical intermediate in closed systems or in controlled occupational settings. Note the recommendations from SIAM 11 with respect to methacrylic acid (CAS Nr. 79-41-4) and the EU risk reduction activity on geotechnical grouting.

FULL SIDS SUMMARY

CAS NO: 868-77-9		SPECIES	PROTOCOL	RESULTS
PHYSICAL-CHEMICAL				
2.1	Melting Point		Unknown	< - 60 °C
2.2	Boiling Point		Unknown	205-220 °C at 1,013 hPa
2.3	Density		Unknown	1.073 g/cm^3 at 20 °C
2.4	Vapour Pressure		Unknown	16.8 Pa at 25 °C
2.5	Partition Coefficient (Log Pow)		OECD TG 107	0.42 at 25 °C
2.6 A.	Water Solubility		Unknown	freely soluble (25 °C); (default ≥100G/L)
B.	pH			None
	pKa			None
2.12	Oxidation: Reduction Potential			None
ENVIRONMENTAL FATE AND PATHWAY				
3.1.1	Photodegradation		Calculated	16 hr
3.1.2	Stability in Water		OECD TG 111	Stable at pH4 and 7 at 25 °C $T_{1/2}$=10.9 days at pH 9 at 25 °C
3.2	Monitoring Data			No study
3.3	Transport and Distribution		Calculated (Level III Fugacity Model)	(Release 100% to air) Air Water Soil Sediment 1.5 % 31.6% 66.8% 0.1% (Release 100% to water) Air Water Soil Sediment 0.0% 99.7% 0.0% 0.3% (Release 100% to soil) Air Water Soil Sediment 0.0% 19.6% 80.3% 0.1%
3.5	Biodegradation		OECD 301C	Readily biodegradable
3.7	Bioaccumulation			None
ECOTOXICOLOGY				
4.1	Acute/Prolonged Toxicity to Fish	*Oryzias latipes*	OECD TG 203	LC_{50}(96hr)>100 mg/L
			OECD TG 204	LC_{50}(14d) >100 mg/L LC_0(14d)=25.0 mg/L
		Pimephales promelas	flow-through	LC_{50}(96hr) = 227 mg/L
4.2	Acute Toxicity to Aquatic Invertebrates (*Daphnia*)	*Daphnia magna*	OECD TG 202	EC_{50}(48hr,Imm)=380 mg/L
4.3	Toxicity to Aquatic Plants e.g. Algae	*Selenastrum capricornutum*	OECD TG 201	EC_{50}(72hr,Bms)= 345mg/L NOEC(72hr,Bms)=160 mg/L
4.5.2	Chronic Toxicity to Aquatic Invertebrates (*Daphnia*)	*Daphnia magna*	OECD TG 202	EC_{50}(21d,Rep)= 90.1mg/L NOEC(21d,Rep)= 24.1 mg/L
4.6.1	Toxicity to Soil Dwelling Organisms			None
4.6.2	Toxicity to Terrestrial Plants			None

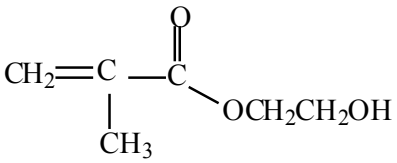
CAS NO: 868-77-9		SPECIES	PROTOCOL	RESULTS
TOXICOLOGY				
5.1.1	Acute Oral Toxicity	Rat	Other (unknown)	LD_{50} > 4000 mg/kg
5.1.2	Acute Inhalation Toxicity	Rat		No study
5.1.3	Acute Dermal Toxicity		Other (unknown)	LD_{50} > 3000 mg/kg
5.2.1	Skin Irritation	Rabbit	Other (unknown)	Not irritating
5.2.2	Eye Irritation	Rabbit	Other (unknown)	Moderately irritating
5.3	Skin Sensitisation	Guinea pig	Buehler/Adjuvant/ miximization test	sensitizing
5.4	Repeated Dose Toxicity	Rat	OECD TG 422	NOAEL = 30 mg/kg/day (males & females) LOAEL = 100 mg/kg/day
5.5	Genetic Toxicity *in vitro*			
A.	Bacterial Test (Gene mutation)	*S. typhimurium, E. coli*	Japanese TG and OECD TG 471	- (With metabolic activation) - (Without metabolic activation)
B.	Non-Bacterial *in vitro* Test (Chromosomal aberrations)	CHL cells	Japanese TG and OECD TG 473	+ (With metabolic activation) + (Without metabolic activation)
5.6	Genetic Toxicity *in vivo*	Mouse	OECD TG 474	Negative
5.7	Carcinogenicity			No study
5.8	Toxicity to Reproduction	Rat	OECD TG 422	NOAEL Parental >= 1000 mg/kg/day (male) NOAEL F1 Offspring >= 1000 mg/kg/day
5.9	Developmental Toxicity/ Teratogenicity	Rat	OECD TG 422	NOAEL Maternal >= 1000 mg/kg/day No teratogenicity
5.11	Experience with Human Exposure	Human	Patch-Test	Ambigous

SIDS Initial Assessment Report

1 IDENTITY

1.1 Identification of the Substance

CAS Number: 868-77-9
IUPAC Name: 2-hydroxyethyl methacrylate
Molecular Formula: $C_6H_{10}O_3$
Structural Formula:



Synonyms: Ethylene glycol methacrylate
Ethylene glycol monomethacrylate
Glycol methacrylate
Glycol monomethacrylate
HEMA
2-HEMA
Hydroxyethyl methacrylate
beta-Hydroxyethyl methacrylate
2-Hydroxyethyl ester, methacrylic acid
2-Hydroxyethyl-2methyl-2-propenoate
Methacrylic acid, 2-hydroxyethyl ester
2-(Methacryloyloxy)ethanol
Methylpropenoic acid , hydroxyethyl ester
2-Methyl-2-propenoic acid-2-hydoxyethyl ester
Methacrylsaeure-2-hydroxyethylester
2-Propenoic acid, 2-methyl-, 2-hydoxyethyl ester

1.2 Purity/Impurities/Additives

Purity: 97.0 - 98.5% , practical/technical grades may contain following impurity .

Diethylene glycol mono-methacrylate: ca <2.0%

Ethylene glycol di-methacrylate: ca <0.2%

Water: ca <0.04%

Methacrylic acid: ca <0.04%

Ethylene oxide : ca <0.001%

4-Methoxy phenol: ca 50 ppm (additive for prevention of polymer formation)

1.3 Physico-Chemical properties

Table 1 Summary of physico-chemical properties

Property	Protocol	Value
Melting Point	Unknown	< - 60 °C practical/technical grade = -12 °C as a physical property for pure chemical
Boiling Point	Unknown	= 205-220 °C (1013 hPa) estimated from boiling points measured at reduced pressure
Density	Unknown	= 1.073 g/cm^3 (20 °C)
Vapour Pressure	Unknown	= 16.8 Pa (25 °C)
Partition Coefficient (Log Pow)	OECD 107	= 0.42 (25 °C)
Water Solubility	Unknown	miscible (25 °C): (default ≥ 100 g/L)

2 GENERAL INFORMATION ON EXPOSURE

2-Hydroxyethyl methacrylate (HEMA) is produced in a fully closed system in Japan. Most of this chemical is used as a monomer for synthesis of polymer that is contained in preparations such as paint, adhesive, coating, dental adhesive system and others. Therefore, major releases of HEMA to the environment may occur only at the production site. The production volume of HEMA was approximately 15,000 tonnes/year in Japan and 42,000 t/year world-wide in 1999.

2.1 Environmental Exposure and Fate

HEMA is readily biodegradable (OECD 301C; BOD: 92-100% after 14days). It is completely miscible in water (CITI, Japan, No.20924).

Direct photodegradation is predicted to occur. The half-life is estimated to be 16 hours in the atmosphere.

This chemical is stable to hydrolysis in water at pH 4 and 7, whereas it is hydrolyzed at pH 9 with a half-life of 10.9 days at 25 °C (CITI, Japan, No. 80924K).

HEMA has a low bioaccumulative potential based on the Log Pow (0.42 at 25 °C) (CITI, Japan, No. 80924K).

2.1.1 Environmental Exposure

The production volume of HEMA was approximately 15,000 tonnes/year in Japan, and 42,000 tonnes/year world-wide in 1999.

According to the monitoring data of Mitsubishi Rayon Co., Ltd., 0.2 tonnes/year of HEMA are released into the effluent treatment plant. 90.0 % of it is removed within the plant and 10.0 % of it (0.02 tonnes/year) is released into sea water.

Predicted local environment concentration (PEC_{local}) is 0.0000006 mg/L, employing the following calculation model. In this case, the dilution factor of 1,000 is adopted.

$$\frac{\text{Amount of release (200,000,000 mg/y) x (1 – Removal rate (0.9))}}{\text{Volume of effluent (31,755,000,000 L/y) x Dilution factor (1,000)}}$$

The Mackay level III fugacity model was employed to estimate the environmental distribution of HEMA in air, water, soil and sediment. This was considered the key study and the results are shown below.

Estimated Distribution Under Three Emission Scenarios

Compartment	Release: 100% to air	Release: 100% to water	Release: 100% to soil
Air	15.3 %	0.0 %	0.1 %
Water	30.2 %	99.7 %	19.6%
Soil	54.4 %	0.0 %	80.2%
Sediment	0.1 %	0.3 %	0.1 %

The results show that if HEMA is released mainly into water, 99.7 % stays in water. It is unlikely to migrate into other compartments. When HEMA is released mainly into air, 15.3 % stays in air and, 30.2 % is transported to water and 54.4 % is transported to soil

2.2 Human Exposure

2.2.1 Occupational Exposure

Occupational exposures at production sites may occur by the inhalation route. Workers are recommended to put on protective gear such as a mask, rubber gloves and goggles to prevent exposure. Spills are collected and incinerated.

The atmospheric concentration was measured at one production site (Japan Industrial Safety and Health Association, JISHA). The monitored data are shown in Table 2.

Table 2: Workplace monitoring data for HEMA

Operation	Monitoring data	n*	Frequency times/day	Working time hrs/time	Maximum EHE mg/kg/day
Sampling	<2.3 mg/m^3 (<0.4 ppm)	14	1	0.05	0.002
Drum filling	<2.3 mg/m^3 (<0.4 ppm)	5	1	0.75	0.031
Waste fluid processing	<2.3 mg/m^3 (<0.4 ppm)	2	1	0.05	0.002
Analysis work	<2.3 mg/m^3 (<0.4 ppm)	6	1	0.05	0.002
Maintenance work	<2.3 – 4.6 mg/m^3 (<0.4 –0.8 ppm) 3.5 mg/m^3 (0.6 ppm) (Average concentration)	3	1	0.25	0.021

n*: number of measurement Total 0.058 mg/kg/day

From Table 1, the highest daily intake (respiratory EHEinh) for a worker (body weight; 70 kg, respiratory volume; 1.25 m^3/hr) assigned to the drum filling work without protection is calculated as 0.031 mg/kg/day. Dermal exposure during drum filling was calculated using the EASE model. The duration of dermal exposure is assumed to be 0.75 hr/day. EHEder for the drum filling worker through hands is calculated as 0.11 mg/kg/day, assuming that the work is classified as non-dispersive, direct handling, and contact level is incidental.

Occupational exposure limits of HEMA are listed below.

Type of limit

Russia (STEL)	20 mg/m^3 (JAN 1993)
NL (MAC-TGG)	0.24 mg/ m^3

2.2.2 Consumer Exposure

HEMA is used as a raw material to be polymerized in paint, adhesive, coating and others, all of which are manufactured in industrial sites. The acrylic polymers manufactured from HEMA and other co-monomers will contain small amounts of residual unpolymerised HEMA. The only known consumer exposure to HEMA in its monomeric form is through use in the dental profession. Low levels of residual, unpolymerized HEMA may be contained in consumer products. Migration of residual monomer from the polymer matrix in articles is expected to be low. Nevertheless, the possibility of consumer exposure cannot be excluded.

3 HUMAN HEALTH HAZARDS

3.1 Effects on Human Health

3.1.1 Toxicokinetics, Metabolism and Distribution

HEMA has been evaluated *in vitro* for the potential to hydrolysis, the initial step of metabolism common to metacrylates category, using nonspecific pocine liver esterase [Bean: 1994]. HEMA was hydrolyzed by more than 80% in a one day period.Specific *in vivo* studies are not available.

3.1.2 Acute Toxicity

Studies in Animals

Many acute toxicity data are reported for rats, mice, guinea pigs and rabbits. Detailed information are generally lacking in all the cases. Judging from the reputation of the origin, representative data are listed below in Table 3. Therefore a key study was not identified. The oral acute toxicity seems to be low because the oral LD_{50} shown in rat with relatively informative information [Roehm GmbH, 1978] is greater than 4,000 mg/kg i.p. Data that generally show severe effects may be regarded as information supportive of the evaluation.

Table 3: Acute toxicity of HEMA in experimental animals

Route	Animals	Values	Type	References
Oral	Rat	5,564mg/kg	LD_{50}	Roehm GmbH., 1978
Oral	Rat	>4,000mg/kg (male & female)	LD_{50}	ICI., 1966
Oral	Mouse	5,457 mg/kg	LD_{50}	Schwach G.W. 1978
Dermal	Rabbit	>3000 mg/kg	LD_{50}	Kirk-Othmer, 1984
i.p.	Rat	1,250 mg/kg	LD_{50}	Lewis R.J., 1992
i.p.	Rat	500 - 1,000 mg/kg, (male & female)	LD_{50}	ICI, 1966
i.p.	Mouse	528 mg/kg	LD_{50}	Lawrence W H, 1972

Studies in Humans

There is no available information.

Conclusion

Acute toxicity of this chemical is low because LD_{50} values are >4,000 mg/kg by oral or >3,000 by dermal routes in rodents.

3.1.3 Irritation

Skin Irritation

Six reports were located. One of them (Rhône-Poulenc Inc., 1980) conducted by contacting for 48 hours showed corrosive effects in rabbit skin. The material, however, used for the test had a pH value of 3, which is inconsistent with the property of this chemical, therefore, the report was omitted from the evaluation. The other 5 studies, e.g. [Roehm 1977] support the conclusion below.

Table 4: Summary of skin irritation studies

Species	Method	Result (primary irritation score)	Reference
Rabbit	Draize Method	Slightly Irritant (1.0)	Van Esch, 1983
Rabbit	Draize Method	not irritating (0.34)	Röhm, 1977
Rabbit	Draize Method	slightly irritating (1.2)	BP chemicals Inc, 1981
Rabbit	DOT (US) Method	Corrosive after 48h application	Rhône-Poulenc Inc., 1980
Rabbit	Range finding	Slightly irritating (1.3)	Rohm & Haas, 1981
Rabbit	7 days repeated application followed by skin histopathology	insignificant irritation using 30 ul of 35% aq. solution	Manabe , 1990

This chemical can be regarded as non-irritant to slightly irritant in rabbit skin

Eye Irritation

Four reports were located. The results range from moderately irritating to corrosive depending upon the methods used. They are listed below:

Table 5: Summary of eye irritation studies

Species	Method	Result	References
rabbit	OECD 405 Draize Method	moderately irritant	Roehm GmbH 1978
rabbit	washing effect not included	highly irritating	BP chemicals Inc 1981
rabbit	documentation insufficient; e.g. amount of application	irritating	ICI 1966
rabbit	range finding study application by occlusion	corrosive	Rohm & Haas 1981

For one study conducted through application by occlusion(Rohm & Haas 1981), the evaluation is impossible as other details are insufficiently reported in the documentation. Other studies in the list above were conducted before the establishment of OECD TG 405, however methods used are consistent with the TG 405. Findings in three studies were similar, namely, corneal opaqueness that persist for a week.

This chemical is a moderate irritant in rabbit eye according to the [OECD 405] guidelines, based on a re-evaluation of the data (Roehm GmbH 1978).

3.1.4 Sensitisation

Studies in Animals

Subcutaneous application of HEMA to guinea pig causes allergic reaction of varied severity depending on the method applied. Relevant studies are tabulated below.

Table 6: Summary of sensitization studies by subcutanous application

Species	Method	Result	Reference
guinea pig	split adjuvant	negative 0/10	Von Blomberg, 1984
guinea pig	split adjuvant haptenised macrophages	negative	Rao, 1981
guinea pig	Polak Method	negative	Parker, 1983
guinea pig	FCA	4/8 positive: but doubtful because negative in 2nd challenge	Van der Walle, 1982-a Van der Walle 1982-b
guinea pig	maximization	7/15 sensitized	Clemmensen, 1984
guinea pig	maximization Magnusson/Kligman	potent: all the sensitised animal (>5) reacted positively by challenge with 10% soln.	BP Chemical, 1981
guinea pig	maximization Magnusson/Kligman	positive ranged 0/20 to 9/12 depending on induction conc./vehicle	Clemmensen, 1985
guinea pig	maximization cross- reaction	no animal reacted to HEMA challenge after unique senitising steps*	Katsuno, 1995
guinea pig	maximization	1 reacted to HEMA challenge out of 10 that received sensitising operation with HPMA	Bjoerkner, 1984

*A dentine primer was subcutaneously applied with or without FCA. 7 Days later HEMA was applied topically. 21 Days later, animals were challenged.

Topical application of HEMA induced no skin sensitisation in guinea pigs when applied topically. Relevant studies are tabulated below.

Table 7: Summary of sensitization studies by topical application

Species	Method	Result	Reference
guinea pig	modified Buehler	negative	Roehm GmbH, 1978
guinea pig	Buehler	negative	Roehm GmbH, 1995

Studies in Humans

Despite the negative or weak sensitizing potential demonstrated in animal experiments, there are significant numbers of reports on humans indicating potential dermal and /or systemic sensitization. 12 reports are considered relevant. Those are tabulated below.

Suspected causes of sensitization include HEMA among other methacrylates and/or other classes of suspected sensitizing agents. Two reports [Mathias, 1979] [Kanerva: 1991] dealt with cases where the cause of sensitization seemed to be HEMA. Allergic reaction found in these cases is complicated with systemic disorders rather than skin sensitization.

The other studies were dealing with subject who had developed skin sensitization supposedly caused by exposure to agents containing HEMA. Authors of the reports generally concluded that cross-reaction may be operating in patch tests and the skin sensitization potential of HEMA may be negligible.

Table 8: Summary of case report and cohort group examination

Subject	Suspected sensitizing Chemicals	Challenge	Reference
symptomatic dental nurse (one woman)	sesitized by HEMA patch test	HEMA	Kanerva: 1991
symptomatic	HEMA	HEMA	Mathias: 1979

Those listed above are certainly dealing with the cases where HEMA is a sensitiser.

Those listed below are dealing with the cases who may have handled other acrylates or methacrylates together with HEMA.

symptomatic 3 printers	mixture/photo-prepolymer	HEMA	Pedersen: 1983
symptomatic 6 workers	mixture/anaerobic sealant	HEMA other acrylates	Conde-Salazar: 1988
3 dental nurses and 3 dentists	Well specified dentin primer/dental adhesive	HEMA	Kanerva: 1992
suspected dental 82 patients	not specified	HEMA	Guerra: 1993
symptomatic dental patients (22)	denture-dental series	HEMA (meth)acrylates & metals	Dutree-Meulenburg: 1992
suspected dental patients (193)		HEMA	Gebhardt: 1995 A review paper
suspected dental patients (235)		HEMA	Kiec-Swierczynska: 1994 A review paper
Dental patients with complaints (756)		HEMA	Richter: 1996
Survey on dental technicians (1813)		HEMA	Schnuch: 1997 A review paper
Suspected dental technician (55)		HEMA	Rustmeyer: 1996 A review paper

Conclusion

Animal studies suggest HEMA is a weak skin sensitizer in guinea pigs giving variable (mixed) results depending on the protocol. Positive reactions were shown only with injection of Freund's adjuvant but not by topical application alone. Whether or not this chemical induces skin sensitization in humans is equivocal; mixed results are reported in the literature on dental clients. Based on human patch test results, HEMA has sensitizing properties and HEMA has potential for cross-reaction with other (meth)acrylates.

3.1.5 Repeated Dose Toxicity

Studies in Animals

Five studies of varied validity have been located. Three of them are oral studies, one dermal and one inhalation. One of the oral studies [MHW, Japan: 1997] was conducted in compliance with internationally accepted guidelines, and was, therefore, identified as the key study. The 2nd was conducted with higher oral dose but the reliability is rather restricted [ICI: 1966], and considered auxiliary to the key study. The 3rd was not presented in a systematic or consistent way and omitted from consideration (Vyshemirskaya 1987). In the 2nd oral study, only one dose level of 2000 mg/kg was given to male and female rat for consecutive 21 applications followed by a 7day recovery phase. It may be relevant to describe findings at a higher dose level than in the key study to understand the mode of action. One female was killed in extremis after the 13th dose. Brain lesion was noticed. The remaining animals of both sexes showed general non-specific ill-effects such as excess salivation, flaccidity or incoordination that may cause suspicion of neurotoxicity, but it was not evident in the key study. Some of these animals and the succumbed showed hepatocellular vacuolation consistent with fatty change.

The dermal study (Manabe 1990) was conducted with one gender and the results were based only on subjective observations. This study is not accepted as a repeated dose toxicity study, but it is used in the skin irritation section. The inhalation study [Gage: 1970] was of restricted validity. Details of these studies are described bellow.

(Oral Gavage) According to the OECD combined repeat dose and reproductive/developmental toxicity screening test guideline [OECD TG 422], 12 male and 12 female SD (Crj: CD) rats received gavage doses of 0 (vehicle; distilled water), 30, 100, 300 or 1,000 mg/kg/day. Dosing period for males was 49 days, and from 14 days before mating to day 3 post partum for females.

One male in the highest dose group died of unknown cause on day 20 of treatment. Six females in the 1000 mg/kg group of 12 died, five before mating and one during gestation. Post mortem examination on the surviving animals in the 1000 mg/kg group including histopathology and blood chemistry revealed renal lesion, however, severity was so slight that it could not be related to the cause of death. The dead animals revealed only agonal changes.

For the males, BUN was elevated or tended to be slightly higher in the 30 mg/kg or more groups, the relative kidney weights were increased in the 100 mg/kg or more and 300 mg/kg groups. Salivation, suppression of body weight gain, decreased food consumption, increased K, Cl and inorganic phosphorus, decreased triglyceride, increased relative liver weights, and dilatation of renal tubules and collection tubules in the kidney were found in the 1000 mg/kg group, 1 animal of which died. For the females, the relative kidney weights were elevated or tended to be high in the 100 mg/kg or more groups. Salivation, decrease in locomotor activity, adoption of a prone position, lacrimation, soiled fur, hypothermia, bradypnea, suppression of body weight gain, decreased food consumption, increased absolute and relative kidney weights, neutrophil cellular infiltration in the papilla and medulla and massive malacia in the medulla oblongata were found in the 1000 mg/kg group, 6 animals of which died [MHW, Japan: 1997]. The NOAEL for repeat dose toxicity is considered for males or females to be 30 mg/kg/day, the lowest dose tested, because the meaning of the only finding (elevated BUN value) is toxicologically not meaningful. The LOAEL was 100 mg/kg/day based on the increase of relative kidney weight.

(Inhalation) Short-term vapor inhalation toxicity was studied in rats with a saturated atmosphere (90 ppm) for 3wks, 6h/d. Except for minor interference in clotting function, postmortem examination by gross- and histo-pathology revealed no change [Gage: 1970].

Studies in Humans

There is no available information on human.

Conclusion

The NOAEL for repeat dose toxicity is considered for males or females to be 30 mg/kg/day by gavage. A LOAEL of 100 mg/kg/day was identified based on the increase of relative kidney weight. A significant number of rats given 1000 mg/kg (the highest dose tested) by gavage died of unknown cause.

3.1.6 Mutagenicity

Four bacterial tests, one non-bacterial *in vitro* test and one genetic *in vivo* test were reported. The summary is shown in the following Table 9.

Table 9: Summary of genotoxicity studies

Type of test	Test system	Dose	Result	Reference
Bacterial test				
Ames test *(reverse mutation)*	*S. typh.* (strains TA100, TA1535, TA98, TA1537) *E. coli* WP2 uvr A	Up to 5,000 ug/plate	Negative (+ & - MA*)	MHW, Japan: 1997
Ames test *(reverse mutation)*	*S. typh.* (strains TA97a, TA97, TA100, TA102 and TA104)	Up to 25 mg/plate	Negative (+ & - MA)	Schweikl H: 1994
Ames test *(reverse mutation)*	*S. typh.* (strains TA1535, TA1537, TA1538, TA98 and TA100)	Up to 2500 ug/plate	Negative (+ & - MA)	Waegemaekers: 1984
Ames test *(reverse mutation)*	*S. typh.* (strains TA98, TA100	Up to 1000 ug/plate	Negative (+ & - MA)	BP Chemicals: 1981
Non-bacterial in vitro test				
Chromosomal aberration test	CHL/IU cells	Up to 1.3 mg/ml	Positive (+ & - MA)	MHW, Japan: 1997
Genetic in vivo test				
Micronucleus test	Rat	Up to 2000 mg/kg bw	Negative	Mitsubishi Rayon: 2001

*MA: Metabolic activation

Bacterial test

The MHW study was well conducted according to the Japanese Guideline for Screening Mutagenicity Testing of Chemicals and OECD TG 471 [MHW: 1997]. The results are negative in *Salmonella typhimurium* TA100, TA1535, TA98, TA1537 and *Escherichia coli* WP2 *uvr*A with or without an exogenous metabolic activation system.

Another study that is noteworthy is an Ames test using a wider range of test strain like *Salmonella typhimurium* TA 97a, TA 97, TA 100, TA 102 and TA 104 with and without metabolic activation system S9-mix: prepared from rat liver [Schweikl 1994]. The method used [Maron D.M. and Ames B.N. (Mutation Res. 113: 173 - 215 (1983))] was generally accepted in the science community. The result showed that HEMA is negative in the test condition applied.

Non-bacterial in vitro test

A chromosomal aberration test according to OECD TG 473 was conducted in cultured Chinese hamster lung (CHL/IU) cells [MHW: 1997].

The lowest concentration producing cytogenetic effects *in vitro* during continuous treatment without metabolic activation was 0.16 mg/ml (clastogenicity). During short-term treatment without metabolic activation, cytogenetic effects were seen at 0.33 mg/ml (polyploidy) and with metabolic activation at 1.3 mg/ml (clastogenicity). This chemical showed genotoxic effects i.e. clastogenicity and polyploidy, however, the latter in the presence of MA was not a dose-dependent effect.

In vivo test

Only one study was reported. This study was performed according to OECD TG 474 and GLP [Mitsubishi Rayon: 2001].

Thirty-one male SD [Crj: CD(SD)IGS, SPF] rats of seven weeks old on the day of administration (five rats per group) were used. The animals in each group were sacrificed 24-hours after the final administration. The experimental design in the micronucleus test is as follows.

Treatment group	**Dose (mg/kg)**	**Number of Treatment (Times)**
Negative control (Water)	0	2
Test substance		
(low dose)	500	2
(middle dose)	1000	2
(high dose)	2000	2
Positive control		
(Cyclophosphamide)	10	1

Each rat was sacrificed by exsanguination from the abdominal aorta under anesthesia, and the femurs were dissected out. The bone marrow cells were collected with PBS (-). The cells were, as usual, processed, stained with acridine orange, and spread on a clean slide glass. The slides were examined under blind condition and scored under a fluorescent microscope. One thousand erythrocytes were scored from each slide for the ratio of polychromatic erythrocytes (PCEs) to the total erythrocytes. 2000 PCEs were further examined to score the number of micronucleated PCEs (MNPCEs) in a slide according to the method of Hayashi et al. For the analysis of the percentage of PCEs, Student's t-test was applied. For the incidence of MNPCEs, the tables of Kastenbaum and Bowman 2 were applied. Criteria for positivity is an induction of a significant increase in the total number of MNPCEs with a dose-dependence.

There were no significant differences in the incidence of MNPCEs between any treatment group and the negative control group. The positive control showed a remarkable increase indicating that the test was conducted appropriately. This chemical does not induce micronuclei under the test conditions employed.

Conclusion

This chemical was not mutagenic in bacteria but was clastogenic and induced polyploidy in mammalian cells *in vitro*. It, however, did not induce micronuclei in rat bone marrow up to the maximum tolerated dose. Based on the weight of evidence, it can be concluded that the chemical is not genotoxic *in vivo*.

3.1.7 Carcinogenicity

There is no available information on carcinogenicity.

3.1.8 Toxicity for Reproduction

The data from the combined OECD repeat dose and reproductive toxicity test [OECD TG 422], by oral route [MHW, Japan: 1997] were identified as the key results because the study was well conducted and reported under GLP. Details of the study are as follows.

SD (Crj: CD) rats received gavage doses of 0 (vehicle; distilled water), 100, 300 and 1,000 mg/kg/day, for males for 49 days and for females from 14 days before mating to day 3 postpartum. The animals were sacrificed on the day 4 of lactation for females (MHW, Japan: 1997). The study was conducted in accordance with the OECD combined repeat dose and reproductive/developmental toxicity screening test [OECD TG 422].

There were no effects of the test substance on the estrus frequency, copulation index, number of conceiving days, fertility index, length of gestation, number of corpora lutea or gestation index. There were no effects of the test substance on the number of live pups born, birth index, number of dead pups, number of pups born, delivery index, live birth index, sex ratio, viability index, external anomalies, body weight or necropsy findings. The above-mentioned reproductive study included external anomalies and necropsy of pups, which revealed to be normal. Thus the NOAEL was 1000 mg/kg/day for both reproduction (both sexes, adults) and developmental (offspring) toxicity.

Conclusion

This chemical does not produce any reproductive nor developmental effects in rats. The NOAEL was considered to be 1,000 mg/kg bw/day for reproductive/developmental toxicity by gavage.

3.1.9 Information on structurally related chemicals

Small quantities of methacrylates may readily be metabolized by saponification into the alcohol and methacrylic acid. [Clayton/Patty: 1981]

Hydroxypropyl methacrylate (HPMA)

The oral LD_{50} value in rats is more than 2000 mg/kg for both sexes. HPMA was tested in accordance with the OECD combined repeat dose and reproductive/developmental toxicity screening test guidelines [OECD TG 422]. SD (Crj: CD) rats received gavage doses of 0 (vehicle; distilled water), 30, 100, 300 and 1,000 mg/kg/day. The dosing period for males was 49 days, and from 14 days before mating to day 3 post partum for females. The study was identical to the study with HEMA referred in this SIAR in the regimen, the method, the author or the laboratory. Two males and one female died in the 1000 mg/kg/day group, similarly to HEMA, during the study, but animals that survived were generally asymptomatic in postmortem examination other than for a slight lowered hoematocrit value and slightly elevated liver weight. The NOAEL for repeat dose toxicity is considered to be 300 mg/kg for both sexes. The NOAEL for reproductive/developmental toxicity is considered to be 1000 mg/kg for both sexes. This chemical did not induce gene mutations in the S. typhimurium and E. coli strains. This chemical induced structual chromosomal aberrations in CHL/IU cells with and without an exogenous metabolic activation system. Polyploidy was induced without an exogenous activation system. [MHW: 1996]

Properties concerning sensitization are also similar to HEMA showing cross-reactivity with other (meth)acrylates that are frequently used together.

Methyl methacrylate (MMA)

HEMA belongs to esters of methacrylic acid. However, HEMA is unique in its hydrophilic nature and relatively low volatility (vapour pressure), that makes a substantial difference from other analogues.

The most representative chemical among the analogues is methyl methacrylate (MMA). According to the SIDS of MMA (CAS Nr. 79-41-4), inhaled MMA is metabolised by local tissue esterase. Inhalation is the most relevant route to evaluate the toxicity and the main effect is a degeneration of the olfactory region of the nose in rat or mouse studies. Other systemic toxicities are degenerative and necrotic lesion in liver, kidney, brain and atrophic change in spleen and bone marrow, part of which may be modulated by physiological change in experimental animals. These effects were not seen in chronic studies up to 1000 ppm. Oral administration to rat resulted in a NOAEL of 200 mg/kg/day.

MMA has in vitro the potential of mutagenic effects, especially clastogenicity. However, this potential is limited to high doses with strong toxic effects. Furthermore, the negative in vivo micronucleus test and negative dominant lethal assay indicate that this potential is not expressed in vivo. There is no relevant concern for carcinogenicity of MMA in humans and animals. Epidemiology data on increased tumour rates in exposed cohorts are of limited reliability and cannot be related to MMA as the sole causal agent.

MMA did not reveal an effect on male fertility when animals had been exposed to up to 9000 ppm. From the available developmental toxicity investigations, including an inhalation study according to OECD guideline 414, no teratogenicity, embryotoxicity or fetotoxicity has been observed at exposure levels up to and including 2028 ppm (8425 mg/m^3).

3.2 Initial Assessment for Human Health

This chemical is supposedly metabolized to methacrylic acid and ethylene glycol. Oral acute toxicity is low as oral LD_{50s} are greater than 4000 mg/kg/day. It is considered as non-irritating to slightly irritating to skin and moderately irritating to eye.

A repeat oral administration test [TG422] was conducted at 30, 100, 300 and 1000 mg/kg/day. For males, overt systemic toxicity after 49 days of treatment was seen at 1000 mg/kg/day such as salivation, suppression of body weight gain, decrease in food consumption, increase in K, Cl or inorganic phosphorus, decrease in triglyceride, increase in relative liver weights. Those findings are supposed to be related to the histological renal change found in the 1000 mg/kg/day group, 1/12 animals of which died. Relative kidney weight increased in the 100 mg/kg/day or more groups. For female, the chemical is administered from 14 days before mating to the 3rd day of lactation. Overt sign of toxicity like salivation, decrease in locomotor activity, adoption of a prone position, lacrimation, soiled fur, hypothermia, bradypnea, suppression of body weight gain, decrease in food consumption, increase in absolute and relative kidney weights, neutrophil cellular infiltration in the papilla and medulla and massive malacia in the medulla oblongata were found in the 1000 mg/kg/day group, 6/12 animals of which died. The NOAEL for repeat dose toxicity is considered for males or females to be 30 mg/kg/day, the lowest dose tested. The LOAEL was 100 mg/kg/day based on an increase of relative kidney weight.

This chemical was not mutagenic in bacteria but was clastogenic and induced polyploidy in mammalian cells *in vitro*. It, however, did not induce micronuclei in rat bone marrow up to the maximum tolerated dose. Based on the weight of evidence, it could be concluded that the chemical was not genotoxic *in vivo*.

In the above mentioned screening test [OECD TG 422], there is no sign of reproductive or developmental toxicity up to 1000 mg/kg/day. Thus the NOAEL was 1000 mg/kg/day for both reproduction (both sexes, adults) and developmental (offspring) toxicity.

The main health effect of concern is whether this chemical dose induces sensitization in human or not. Animal studies suggest HEMA is a weak skin sensitizer in guinea pigs giving variable (mixed) results depending on the protocol. Positive reactions were shown only with injection of Freund's adjuvant but not by topical application alone. Whether or not this chemical induces skin sensitization in humans is equivocal; mixed results are reported in the literature on dental clients. Based on human patch test results, HEMA has sensitizing properties and HEMA has potential for cross-reaction with other (meth)acrylates.

4 HAZARDS TO THE ENVIRONMENT

4.1 Aquatic Effects

HEMA has been tested in a limited number of aquatic species. Results are summarized in Table 10. All the data shown here were derived from experiments conducted according to GLP, and the chemical concentrations in the testing media were analyzed during the course of the experiments. Medaka (*Oryzias latipes*) seemed to be the most sensitive among the organisms for acute toxicity. The toxicity (growth inhibition) to aquatic plants (algae; *Selenastrum capricornutum*) was 345 mg/L for 72 h-EC_{50} and 160 mg/L for 72hr-NOEC (EA, Japan: 1997). LC_{50} of the acute (96 h) and prolonged toxicity (14 d) for fish (Medaka; *Oryzias latipes*) were both determined as >100 mg/L, (EA, Japan: 1997). The acute (mortality or immobility) and chronic data (reproduction) for daphnid were 380 mg/L (48 h-EC_{50}), 90.1 mg/L (21d-EC_{50}), and 24.1mg/L (21d-NOEC), respectively, (EA, Japan: 1997).

Table 10: Summary of effects of HEMA on aquatic organisms

Organism	Test duration	Result (mg/L)	Reference
Aquatic plants, e.g. algae			
Green alga (*Selenastrum capricornutum*)	72 h (op)	EC_{50} (Bms) =345 (nc*)	EA, Japan (1997)
	72 h (op)	NOEC(Bms) =160(nc*)	EA, Japan (1997)
Invertebrates			
Daphnid (*Daphnia magna*)	48 h (s)	EC_{50} (Imm) =380 (nc*)	EA, Japan (1997)
	21 d (ss)	EC_{50} (Rep) =90.1 (nc*)	EA, Japan (1997)
	21 d (ss)	NOEC(Rep) =24.1 (nc*)	EA, Japan (1997)
Fish			
Medaka (*Oryzias latipes*)	96 h (ss)	LC_{50} > 100 (nc*)	EA, Japan (1997)
	14 d (f)	LC_{50} >100 (nc*)	EA, Japan (1997)
		LC_0 =25.0 (nc*)	
Fathead minnow (*Pimephales promelas*)	96 h (f)	LC_{50} = 227	Geiger et al. (1986)

op = open system f = flow through s = static ss = semi-static

nc* = calculated based on nominal concentrations, because measured concentrations were >80% of nominal concentrations

Bms = biomass Imm = immobilization Rep = reproduction

4.2 Terrestrial Effects

There is no available information.

4.3 Other Environmental Effects

There is no available information.

4.4 Initial Assessment for the Environment

The potential environmental distribution of HEMA was obtained from a generic fugacity model Mackay level III under three emission scenarios.

The results show that if HEMA is released mainly into water, it is unlikely to migrate into other compartments. But, if HEMA is released mainly to air, 1.5 % stays in air, 31.6 % and 66.8 % are transported to water and soil, respectively. This chemical is readily biodegradable (BOD: 92 - 100 % after 14 days), and is considered as of low potential for bioaccumulation based on a low LogPow (0.42 at 25 °C).

Although information on the aquatic toxicity of HEMA is limited, results for algae, fish and aquatic invertebrates are summarized below.

The toxicity (growth inhibition: OECD TG 201) to algae (*Selenastrum capricornutum*) was 345 mg/L for 72 h-EC_{50} and 160 mg/L for 72 h-NOEC (EA, Japan: 1997). The acute (immobility: OECD TG 202) and chronic data (reproduction: OECD TG 202) for daphnid were 380 mg/L (48 h-EC_{50}), 90.1 mg/L (21d-EC_{50}) and 24.1 mg/L (21d-NOEC) respectively (EA, Japan: 1997). The acute LC50 (96 h: OECD TG 203) was 227 mg/L for fish (*Pimephales promelas*) (Roehm GmbH, 1986) while the prolonged toxicity (14 d: OECD TG 204) for fish (Medaka; Oryzias latipes) was >100 mg/L (EA, Japan: 1997). An assessment factor of 100 was used to calculate the predicted no-effect concentration (PNEC) of 0.241 mg/L for aquatic organisms because two chronic data (daphnid and algae) were available.

5 RECOMMENDATIONS

The chemical is currently of low priority for further work.

6 REFERENCES

Bjoerkner B.; Contact Allergy to 2-Hydroxypropyl Methacrylate (2-HPMA) in an Ultraviolet Curable Ink; Acta Derm. Venerol (Stockh) 64(3): 264-267 (1984)

BP chemicals Inc.: Irritation and Mutagenicity tests of Hyroxyethyl methacrylate and related studies with cover letter, Microfishe No.: OTS0556083 (original data produced 03/10/81)

Chemicals Inspection and Testing Institute, Japan. Report No.20924

Chemicals Inspection and Testing Institute, Japan. Report No.80924K

Clayton G.D., Clayton F.E.; Patty's Industrial Hygiene and Toxicology; Vol 2A, 3 rd. ed.: 2291-2302 (1981), John Wiley & Sons Inc., USA, ISBN: 0-471-16042-3

Clemmensen S.; Cross-reaction patterns in guinea pigs sensitized to acrylic monomers; Drug and Chemical Toxicology 7(6): 527-540 (1984)

Clemmensen S.; Sensitizing potential of 2-hydroxyethyl-methacrylate; Contact Dermatitis 12(4): 203-208 (1985)

Conde-Salazar L., Guimaraens D., Romero L.V.; Occupational allergic contact dermatitis from anaerobic acrylic sealants; Contact Dermatitis 18: 129-132 (1988)

Dutrée-Meulenberg R.O.G.M., Kozel M.M.A., Van Joost Th.; Burning mouth syndrome: A possible etiologic role for local contact hypersensitivity; Journal of the American Academy of Dermatology 26: 935 - 940 (1992)

Environmental Agency of Japan (1997), unpublished data

Gage J.C.; The subacute Inhalation Toxicity of 109 Industrial Chemicals; Brit. J. Industr. Med. 27: 1-18 (1970)

Geiger D.L., Poirier S.H., Brooke L.T., Call D.J.; Acute Toxicities of Organic Chemicals to Faethead Minnows (Pimephales promelas); Vol. III, University of Wisconsin-Superior (1986)

Guerra L., Vincenzi C., Peluso A.M., Tosti A.: Prevalence and sources of occupational contact sensitization to acrylates in Italy; Contact Dermatitis 28: 101-103 (1993)

ICI; Hydroxyethyl methacrylate - Toxicological properties; Imperial Chemical Industries Limited Industrial Hygiene Research Laboratories; unpublished report, report No. TR/555 (25.10.1966)

Kirk-Othmer; Encyclopedia of Chemical technology, 3 rd ed.; New York, NY: John Wiley and Sons 15: 347-369, 386-371 (1978-1984); ISBN: 0-471-02068-0

Katsuno K., Manabe A., Itoh K., Hisamitsu H., Wakumoto S.,Nakayama S., Yoshida T.; A delayed hypersensitivity reactionto dentin primer in the guinea pig; J. Dent. 23(5): 295 -299 (1995)

Kanerva L., Estlander T., Jolanki R., Tarvainen K.; Occupational acrylate allergy in dental personnel; Allergologie 15(9): 322 (1992)

Kanerva L., Turjanmaa K., Jolanki R., Estlander T.; Occupational allergic contact dermatitis from iatrogenic sensitization by a new acrylate dentin adhesive; European Journal of Dermatology 1: 25 - 28 (1991)

Kiec-Swierczynska M.: Occupational allergy to acrylates; Medycyna Pracy 45(4): 297 - 302 (1994)

Lawrence W.H., Bass G.E., Purcell W.P., Autian J.; Use of Mathematical Models in the Study of Structure-Toxicity Relationship of Dental Compounds: I. Esters of Acrylic and Methacrylic Acids; J. Dental. Res. 51(2): 526-535 (1972)

Manabe A., Hasegawa T., Chigira H., Itoh K., Wakumoto S., Nakayama S., Tachikawa T.; Morphological Changes of Rabbit Skin by Application of Dentin Primer; Dent. Mater. J. 9(2):147-152 (1990)

Mathias C.G.T., Cadwell T.M., Maibach H.I.; Contact dermatitis and gastrointestinal symptoms from
hydroxyethylmethacrylat; Britisch Journal of Dermatology 100: 447-449 (1979)

Mitsubishi Rayon Co., Ltd. (2001). Unpublished test, Micronucleus test

MHW, Japan (1996) Ministry of Health and Welfare, Toxicity Testing Reports of Environmental Chemicals 4, 561 - 586

MHW, Japan (1997) Ministry of Health and Welfare, Toxicity Testing Reports of Environmental Chemicals 5, 525 - 552

Parker D., Turk J.L.; Contact sensitvity to acrylate compounds in guinea pigs; Contact Dermatitis 9: 55-60 (1983)

Pedersen N.B., Senning A., Nielsen A.O.; Different sensitising acrylic monomers in Napp printing plate; Contact Dermatitis 9: 459-464 (1983)

Rustemeyer T., Frosch P.J.: Occupational skin diseases in dental laboratory technicans; Contact Dermatitis 34: 125 - 133 (1996)

Schnuch A.: Allergien gegen Hydroxyethylmethacrylat, Hydroxypropylmethgacrylat, Hydroxyethylacrylat und Hydroxypropylacrylat; personnel communication to Dr. Müllerschön and Dipl.-Ing. G. Ritz, Röhm GmbH; Informationsverband Dermatologischer Kliniken, Göttingen (1997)

Rao K.S., Betso J.E., Olson K.J.; A collection of guinea pig sensitization test results--Grouped by chemical class; Drug and Chemical Toxicology 4(4): 331-351 (1981) Roehm GmbH, unpublished report No 77-009 (1977)

Roehm GmbH, unpublished report No 78-003 (1978)

Röhm GmbH, personal communication

Röhm GmbH, unpublished report No. 77-009 (1977)

Rohm & Haas: Acute Range-Finding rabbit eye/skin irritation studies (final report) withcover letter dated 072192; Microfiche No.:OTS0544796; Rohm & Haas Co.,data produced 07/22/81

Rhône-Poulenc Inc.: Initial Submission: DOT Skin corrosionof SIPOMER HEM-HP-T in rabbits with cover letter dated 061992; Microfiche No.: OTS0541037; Prod. Safety Labs., date produced 07/09/80

Richter G., Geier J.: Dentalwerkstoffe – Problemsubstanzen in der allergologischen Diagnostik ?; Hautarzt 47: 839 – 843 (1996)

Schweikl H. et al. (1994) Mutagenicity of dentinbonding agents; Journal of Biomedical Materials ResearchVol. 28: 1061 – 1067

Van der Walle H.B., Bensink T.; Cross reaction pattern of 26 acrylic monomers on guinea pig skin; Contact Dermatitis 8:376-382 (1982)

Van der Walle H.B., Klecak G., Bensink T.; Sensitizing potential of 14 mono (meth) acrylates in the guinea pig; Contact Dermatitis 8: 223 - 235 (1982)

Van Esch C.; UV curing-now and in the future; European Supplement to Polymers Paint Colour Journal 5: 79-85 (1983)

Von Blomberg-Van Der Flier M., Scheper R.J., Boerrigter G.H., Polak L.; Induction of Contact Sensitivity to a Broad Variety of Allergens with Haptenized Macrophages; Journal of Investigative Dermatology 83(2): 91-95 (1984)

Vyshemirskaya L.D., Doloshitskii S.L., Romaniv R.V.; Investigation of thresholds and delayed effects of ethylene glcol monomethacrylate; Gig. Sanit. 11: 81 - 82 (russian), german translation available (1987)

Waegemaekers T.H.J.M., Bensink M.P.M.; Non-mutagenicity of 27 aliphatic acrylate esters in the Salmonella-microsome test; Mut. Res. 137: 95-102 (1984)

SIDS

Dossier

Existing Chemical	:	ID: 868-77-9
CAS No.	:	868-77-9
EINECS Name	:	2-hydroxyethyl methacrylate
EINECS No.	:	212-782-2
TSCA Name	:	2-Propenoic acid, 2-methyl-, 2-hydroxyethyl ester
Molecular Formula	:	C6H10O3

Producer Related Part

Company	:	MITSUBISHI RAYON CO., LTD.
Creation date	:	20.08.2001

Substance Related Part

Company	:	MITSUBISHI RAYON CO., LTD.
Creation date	:	20.08.2001
Memo	:	SIAM13
Printing date	:	22.08.2001
Revision date	:	
Date of last Update	:	22.08.2001
Number of Pages	:	105
Chapter (profile)	:	Chapter: 1, 2, 3, 4, 5, 7
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

1.0.1 OECD AND COMPANY INFORMATION

Type : lead organisation
Name : MITSUBISHI RAYON CO., LTD.
Partner :
Date :
Street : 6-41, Konan 1-Chome, Minato-ku
Town : 108-8506 Tokyo
Country : other: Japan
Phone : +81-3-5495-3009
Telefax : +81-3-5495-3246
Telex :
Cedex :
Source : MITSUBISHI RAYON CO., LTD.
17.08.2001

Type : cooperating company
Name : NIPPON SHOKUBAI CO., LTD.
Partner :
Date :
Street : Kogin Bldg, 4-1-1 Koraibashi, Chuo-ku
Town : 541-0043 Osaka
Country : other: Japan
Phone : +81-6-6223-9258
Telefax : +81-6-6201-2857
Telex :
Cedex :
Source : MITSUBISHI RAYON CO., LTD
17.08.2001

Type : cooperating company
Name : MITSUBISHI GAS CHEMICAL COMPANY, INC.
Partner :
Date :
Street : Mitsubishi Bldg. 5-2, Marunouchi 2-chome, Chiyoda-ku
Town : 100-8324 Tokyo
Country : other: Japan
Phone : +81-3-3283-4821
Telefax : +81-3-3214-0930
Telex :
Cedex :
Source : MITSUBISHI RAYON CO., LTD
17.08.2001

Type :
Name : BOREALIS POLYMERS OY
Partner :
Date :
Street : POB 330
Town : 06100 PORVOO
Country : Finland
Phone : +358-15-5413284
Telefax : +358-15-5417310
Telex :
Cedex :
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type :
Name : Chemimpo B.V.
Partner :
Date :
Street : Graaf van Solmsweg 52
Town : 5222 BP 's Hertogenbosch
Country : Netherlands
Phone : 073 - 621 01 55
Telefax : 073 - 621 95 52
Telex :
Cedex :
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA) 11.02.2000

Type :
Name : DSM Resins BV
Partner :
Date :
Street : Ceintuurbaan 5
Town : 8022 AW Zwolle
Country : Netherlands
Phone : 038 4569569
Telefax : 038 4569500
Telex :
Cedex :
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA) 11.02.2000

Type :
Name : ECEM European Chemical Marketing B.V.
Partner :
Date :
Street : Hogehilweg 10
Town : 1101 CC Amsterdam
Country : Netherlands
Phone : 020-6912001
Telefax : 020-6911930
Telex :
Cedex :
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA) 11.02.2000

Type :
Name : International Speciality Chemicals Ltd.
Partner :
Date :
Street : Charleston Industries Estate, Hardley, Hythe
Town : SO45 32G Southampton
Country : United Kingdom
Phone :
Telefax :
Telex :
Cedex :
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA) 11.02.2000

Type :
Name : Petrasol B.V.

Partner :
Date :
Street : P.O.Box 222
Town : 4200 AE Gorinchem
Country : Netherlands
Phone : +31 183 630555
Telefax : +31 183 632272
Telex : 23602 petr nl
Cedex :
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA) 11.02.2000

Type :
Name : Roehm GmbH
Partner :
Date :
Street :
Town : 64275 Darmstadt
Country : Germany
Phone :
Telefax :
Telex :
Cedex :
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA) 11.02.2000

Type :
Name : Rohm and Haas France S.A.
Partner :
Date :
Street : 371 rue L. van Beethoven
Town : 06565 Valbonne
Country : France
Phone :
Telefax :
Telex :
Cedex :
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA) 11.02.2000

Type :
Name : TRANSOL CHEMICALS BV
Partner :
Date :
Street : POSTBUS 1030
Town : 2980BA RIDDERKERK
Country : Netherlands
Phone : 0180-460300
Telefax : 0180-417310
Telex :
Cedex :
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA) 11.02.2000

Type :
Name : TRANSOL Chemiehandel GmbH
Partner :
Date :
Street : Ruhrallee 201

Town : 45136 Essen
Country : Germany
Phone : 0201/8959-0
Telefax : 0201/8959-100
Telex : 8 579 tra d
Cedex : -/-
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

1.0.2 LOCATION OF PRODUCTION SITE

1.0.3 IDENTITY OF RECIPIENTS

1.1 GENERAL SUBSTANCE INFORMATION

Substance type : organic
Physical status : liquid
Purity : >= 97 % w/w
Source : MITSUBISHI RAYON CO., LTD
17.08.2001

Substance type : organic
Physical status : liquid
Purity : % w/w
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Substance type :
Physical status : liquid
Purity : % w/w
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

1.1.0 DETAILS ON TEMPLATE

1.1.1 SPECTRA

1.2 SYNONYMS

beta-Hydroxyethyl methacrylate
Source : MITSUBISHI RAYON CO., LTD
17.08.2001

Methacrylic acid, 2-hydroxyethyl ester
Source : MITSUBISHI RAYON CO., LTD
17.08.2001

Methacrylic acid, 2-hydroxyethyl ester
Source : MITSUBISHI RAYON CO., LTD
17.08.2001

2-(Methacryloyloxy)ethanol
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
08.11.1993

2-HEMA
Source : TRANSOL Chemiehandel GmbH Essen
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
05.06.1996

2-Hydroxyethyl ester
Source : ECEM European Chemical Marketing B.V. Amsterdam
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
31.12.1997

2-hydroxyethyl methacrylate
Source : ISIS/RISKLINE release VI, 1997, Haskoning
Petrasol B.V. Gorinchem
International Speciality Chemicals Ltd. Southampton
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
05.05.1998

2-Hydroxyethyl-2-methyl-2-propenoat
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
22.11.1993

2-Methyl-2-propenoic acid-2-hydroxyethyl ester
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
16.11.1993

2-Propenoic acid, 2-methyl-, 2-hydroxyethyl ester
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
08.11.1993

beta-Hydroxyethyl methacrylate
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
08.11.1993

BETA-HYDROXYETHYLMETHACRYLAAT, ETHYLEENGLYCOLMETHACRYLAAT,METHACRYLZUUR, 2-HYDROXYETHYLESTER
Source : Chemimpo B.V. "s Hertogenbosch
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
09.04.1998

Ethylene Glycol Methacrylate
Source : ECEM European Chemical Marketing B.V. Amsterdam
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
31.12.1997

Ethylene glycol methacrylate
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
08.11.1993

Ethylene glycol monomethacrylate

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
08.11.1993

Glycol methacrylate
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
08.11.1993

Glycol monomethacrylate
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
08.11.1993

HEMA
Source : DSM Resins BV Zwolle
Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
28.04.1998

Hydroxyethyl methacrylate
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
21.03.1994

Methacrylic acid
Source : ECEM European Chemical Marketing B.V. Amsterdam
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
31.12.1997

Methacrylic acid, 2-hydroxyethyl ester
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
08.11.1993

Methacrylsäure-2-hydroxyethylester
Source : TRANSOL Chemiehandel GmbH Essen
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
05.06.1996

methylpropenoic acid,hydroxyethyl ester
Source : DSM Resins BV Zwolle
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
28.04.1998

1.3 IMPURITIES

CAS-No : 2351-43-1
EINECS-No :
EINECS-Name : Di-Et-Glycol Mono-methacrylate
Contents : < 2 % w/w
Source : MITSUBISHI RAYON CO., LTD
17.08.2001

CAS-No : 97-90-5
EINECS-No : 202-617-2
EINECS-Name : ethylene dimethacrylate
Contents : < .2 % w/w

Source : MITSUBISHI RAYON CO., LTD
17.08.2001

CAS-No : 7732-18-5
EINECS-No : 231-791-2
EINECS-Name : water
Contents : < .04 % w/w
Source : MITSUBISHI RAYON CO., LTD
17.08.2001

CAS-No : 79-41-4
EINECS-No : 201-204-4
EINECS-Name : methacrylic acid
Contents : < .04 % w/w
Source : MITSUBISHI RAYON CO., LTD
17.08.2001

CAS-No : 75-21-8
EINECS-No : 200-849-9
EINECS-Name : ethylene oxide
Contents : < .01 % w/w
Source : MITSUBISHI RAYON CO., LTD
17.08.2001

1.4 ADDITIVES

1.5 QUANTITY

Production during the last 12 months :
Import during the last 12 months :
Quantity produced : tonnes in
Remark : 15,000 t/y in Japan and 42,000 t/y world-wide in 1999
Source : MITSUBISHI RAYON CO., LTD
17.08.2001

Production during the last 12 months :
Import during the last 12 months :
Quantity : 10 000 - 50 000 tonnes in
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

1.6.1 LABELLING

Labelling : as in Directive 67/548/EEC
Symbols : Xi
Nota : D D
Specific limits : yes
R-Phrases : (36/38) Irritating to eyes and skin
(43) May cause sensitization by skin contact
S-Phrases : (2) Keep out of reach of children
(26) In case of contact with eyes, rinse immediately with plenty of water

and seek medical advice
(28) After contact with skin, wash immediately with plenty of ...
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

1.6.2 CLASSIFICATION

Classification : as in Directive 67/548/EEC
Class of danger : irritating
R-Phrases : (36/38) Irritating to eyes and skin
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Classification : as in Directive 67/548/EEC
Class of danger :
R-Phrases : (43) May cause sensitization by skin contact
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

1.7 USE PATTERN

Type : industrial
Category : other: paints, adhesives, binding and others
Source : MITSUBISHI RAYON CO., LTD
17.08.2001

Type : type
Category : Use in closed system
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type : type
Category : Use resulting in inclusion into or onto matrix
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type : type
Category : Wide dispersive use
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type : industrial
Category : Basic industry: basic chemicals
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type : industrial
Category : Chemical industry: used in synthesis
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type : industrial
Category : Paints, lacquers and varnishes industry
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type : industrial
Category : Paper, pulp and board industry
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type : industrial
Category : Polymers industry
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type : industrial
Category : other: Chemical industry monomer for synthesis of polymers (> 95 %)
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type : use
Category : Adhesive, binding agents
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type : use
Category : Intermediates
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type : use
Category : other: embedding medium for enzyme histochemistry, dehydrating agent in histochemistry and immunohistochemistry (< 1 %)
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type : use
Category : other: excipient in pharmaceutical formulations (< 1 %)
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type : use
Category : other: modifier for alkyd resins
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type : use
Category : other: modifier for alkylated resins
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type : use
Category : other: surface tension controlling agent
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

Type : use
Category : other
Source : EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
11.02.2000

1.7.1 TECHNOLOGY PRODUCTION/USE

1.8 OCCUPATIONAL EXPOSURE LIMIT VALUES

Type of limit : MAC (NL)
Limit value : .24 mg/m3
Remark : As far as we are aware the only other country to assign a workplace standard is Russia (20 mg/m3).
The rationale upon which the Dutch MAC-TGG value is based would appear to be lacking in detail. We have presented a case to the authorities requesting a review of this value.
We operate and recommend a workplace standard of 5 mg/m3 8 hour TWA. Routine monitoring campaigns for personnel operating ISC's manufacturing plant show personal exposures of < 0.1mg/m3 8hr TWA (for approx 55% of population sampled), with mean exposures being <0.15mg/m3 8hr TWA.
We consider the skin sensitising potential to be the most important hazard and as such operate control measures to eliminate direct skin contact or where a potential for skin contact does exist to specify the type of PPE required to ensure safe handling (especially use of neoprene or double dipped nitrile gloves).
¿
Source : International Speciality Chemicals Ltd. Southampton
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
18.05.1994

Type of limit : MAC (NL)
Limit value : .04 ml/m3
Remark : Year: 1993
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
15.04.1994 (40)

Type of limit : MAK (DE)
Limit value :
Remark : MAK-value does not exist.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
15.04.1994 (19)

Type of limit : MAK (DE)
Limit value :
Remark : MAK-value does not exist.
Classified as skin sensitizer, (MAK 1996).
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
02.04.1997 (20) (21)

Type of limit : other: MAC-TGG
Limit value : .24 mg/m3
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
27.03.1997 (130)

Type of limit : other: twa
Limit value : 3 other: ppm
Source : Rohm and Haas France S.A. Valbonne

EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

26.06.1998

1.9 SOURCE OF EXPOSURE

Memo : Migration
Remark : Acrylic polymers manufactured from HEMA and other co-Monomers will contain low amounts of residual unpolymerised HEMA. Migration of residual HEMA from polymer articles is very low as typified by migration into food simulants under EEC food contact regulations for plastic materials (Directive 90/128/EEC).
Emissions in the production process are low, typically below 1 kg/year are released into the air.
In the monomer production the substance is not released into the waste water.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

17.03.1997 (109)

Memo : Workplace measurements during production of monomer and delivery of 2-HEMA
Method : according to TRGS 402 (with personal-air sampling)
Remark : From 19.11.96 to 17.12.96 28 workplace exposure measurements in air of 2-HEMA were done. All measurements were done by personal-air sampling on silica gel. Exposure peaks can occur during filter-changeing in a production pipeline, filling, cleaning or opening of drums or reaction vessels. After absorption HEMA is desorbed with methanol from the silica gel and than determined by gas chromatography. The detection limit of the analysis method for 2-Hydroxyethyl methacrylate was 0,09 - 0,19 mg/m3 (8 hour sampling). The validation of the analysis method showed that for concentrations between 1,5 - 12,5 mg/m3 hydroxy ester in air the precision as relative standard deviation was between 1,6 and 6,1 %. The accuracy of the results was +/- 10 %. Lower concentrations and concentrations close to the detection limit at approximately 0,2 mg/m3 the precision as relative standard deviation worsened to 11 - 24 % and the accuracy of the results was +/- 50 %.
Result : 4 (short term measurements 0,42 - 2,93 hours) of the 28 workplace measurements were above the detection limit of 2-Hydroxethyl methacrylate.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
Documentation sufficient but method not optimized.

17.03.1997 (114) (115)

Remark : HEMA is produced at one site only. The basic production process is as follows;
Methacrylic acid is charged and catalysed. Ethylene oxide is added in the correct ratio. Excess oxide is reduced by vacuum stripping and the product is purified by vacuum distillation.
Source : International Speciality Chemicals Ltd. Southampton
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

18.05.1994

Remark : Acrylic polymers manufactured from HEMA and other co-Monomers will contain low amounts of residual unpolymerised HEMA. Migration of residual HEMA from polymer articles is very low as typified by migration into food simulants under EEC food contact regulations for plastic materials (Directive 90/128/EEC).
Emissions in the production process are low, typically below 1 kg/year are released into the air.
In the monomer production the substance is not released into the waste water.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
31.05.1994 (93)

1.10.1 RECOMMENDATIONS/PRECAUTIONARY MEASURES

1.10.2 EMERGENCY MEASURES

1.11 PACKAGING

1.12 POSSIB. OF RENDERING SUBST. HARMLESS

1.13 STATEMENTS CONCERNING WASTE

1.14.1 WATER POLLUTION

Classified by : KBwS (DE)
Labelled by : KBwS (DE)
Class of danger : 1 (weakly water polluting)
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
20.02.1997

Classified by : other: Roehm GmbH
Labelled by : other: Roehm GmbH
Class of danger : 1 (weakly water polluting)
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
23.11.1993

1.14.2 MAJOR ACCIDENT HAZARDS

1.14.3 AIR POLLUTION

Classified by : TA-Luft (DE)
Labelled by : TA-Luft (DE)

Number : 3.1.7 (organic substances)
Class of danger : III
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
18.02.1997 (108)

Classified by : other: Roehm GmbH
Labelled by : other: Roehm GmbH
Number :
Class of danger : II
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
12.11.1993

1.15 ADDITIONAL REMARKS

Memo : Analytical determination
Remark : Microdetermination of Methacrylic acid esters in aqueous medium by gas chromatography/ mass spectrometry. Selected Ion Monitoring (SIM)-technique provides detection of 1 pg/ul HEMA. The procedure is suitable for the determination of dental adhesive paste monomers.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (1) valid without restriction
04.02.1997 (24)

Memo : Disposal considerations
Remark : Waste is hazardous and therefore particularly to be kept under surveillance.
It must be disposed of in accordance with the regulations after consulation of the competent local authorities and the disposal company in a suitable and licened facility.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
Material safety data sheet.
18.02.1997 (108)

Memo : Disposal of waste
Remark : Options for disposal of waste or spilled material. Large quantities can be returned to the manufacturer for recycle. Small quantities may be incinerated under controlled conditions in incinerators suitable for methacrylates. Combustion products include carbon monoxide, carbon dioxide and water. The product must be disposed of as special waste in accordance with regulations for special waste.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
01.04.1997

Memo : Safety and Handling
Remark : Hydroxyethyl methacrylate was demonstrated to pass through vinyl gloves. The passage time for HEMA through vinyl gloves was 1 - 3 min. The passage time of HEMA through most of the latex or the modified latex gloves was 5 - 8 min.
Multilayered glove materials have been shown to have especially good chemical resistance. The 4H glove (laminated

glove in which ethylene vinyl alcohol copolymer is laminated with polyethylene on both sides; Safety 4 A/S, Lyngby, Denmark) which resits acrylics' penetration for 4 hours were recommended to avoid contact to HEMA.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (2) valid with restrictions
10.03.1997 (8) (51) (73) (80)

Memo : Storage Conditions
Remark : Temperature during storage must be kept low to minimize formation of peroxides and other oxidation products. Storage temperature below 30 °C are recommended for polyfunctional methacrylates. The methacrylate monomer should not be stored for longer than half a year. Hydroxethyl methacrylate is sensitive to UV light and should, therefore, be stored in the dark. The methacrylic ester may be stored in mild steel, stainless steel, or aluminium.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (2) valid with restrictions
Handbook data.
03.04.1997 (57) (108)

Memo : Storage/ Transport
Remark : Fill the container by approximately 90 % only as oxygen (air) is required for stabilisation. With large storage containers, make sure the oxygen (air) supply is sufficient to ensure stability. Keep out of light.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (2) valid with restrictions
Material safety data sheet.
18.02.1997 (108)

Memo : Thermal decomposition behaviour
Remark : The thermal decomposition behaviour of 2-Hydroxyethyl methacrylate (HEMA) and Poly-HEMA was investigated by pyrolysis-gas chromatography. The pyrolysis temperature was 700 °C. The formation of the corresponding monomers and methacrylic acid was monitored to evaluate the relative importance of the two processes, depolymerization and ester group decomposition. The monomer HEMA undergoes marked thermal decomposition. After pyrolysis the monomer content was 77.3 % and 5.3 % Methacrylic acid were detected. The Diol content was 0 %. The content of the volatile products of the pyrolysis of Poly-HEMA was 10.4 % HEMA (monomer), 8.5 % Methacrylic acid and 0 % Diol.
It has to be taken in mind, that Methacrylic acid undergoes thermal degradation to about 50 %, indicating that the actual amounts of Methacrylic acid formed during pyrolysis of both monomers and polymers are probably twice the amounts observed.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Test substance : Purity: 92 %
Diester content: 1.3 %

Reliability : (2) valid with restrictions
Study well documented, meets generally accepted scientific

principles, acceptable for assessment.

03.04.1997 (4)

Remark : Uninhibited product is liable to polymerise.Ensure product is well oxygenated with air to ensure that the polymerisation inhibitor is active.Heating is also liable to cause polymerisation if inhibitor level is depleted. Incineration is the recommended method of disposal. HEMA is not classified as Danderous for transport.

Source : International Speciality Chemicals Ltd. Southampton
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

18.05.1994

Remark : Options for disposal of waste or spilled material. Large quantities can be returned to the manufacturer for recycle. Small quantities may be incinerated under controlled conditions in incinerators suitable for methacrylates. Combustion products include carbon monoxide, carbon dioxide and water. The product must be disposed of as special waste in accordance with regulations for special waste.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

29.05.1994

1.16 LAST LITERATURE SEARCH

1.17 REVIEWS

1.18 LISTINGS E.G. CHEMICAL INVENTORIES

2.1 MELTING POINT

Value : < -60 ° C
Sublimation :
Method : other: no data
Year : 1999
GLP : no
Test substance : other TS: source; not available
Source : MITSUBISHI RAYON CO., LTD.
Flag : Critical study for SIDS endpoint
22.08.2001 (72)

Value : <= -10 ° C
Decomposition : no at ° C
Sublimation : no
Method : other: Not specified
Year :
GLP : no
Test substance : other TS: source; not available
Source : MITSUBISHI RAYON CO., LTD.
19.08.2001 (11)

Value : < -60 ° C
Sublimation :
Method : other: no data
Year : 1993
GLP : no data
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
24.05.1994 (86) (94)

Value : < -60 ° C
Sublimation :
Method : other: no data
Year : 1996
GLP : no data
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
18.02.1997 (86) (108)

Value : ca. -60 ° C
Decomposition : no at ° C
Sublimation : no
Method : other
Year :
GLP : no data
Test substance :
Remark : Werte laut Lieferant.
Source : TRANSOL Chemiehandel GmbH Essen
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
05.06.1996

Value : = -12 ° C
Decomposition : no at ° C
Sublimation : no
Method : other: no data

Year : 1987
GLP : no data
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
12.11.1993 (123)

Value : = -12 ° C
Decomposition : no at ° C
Sublimation : no
Method : other: no data
Year : 1987
GLP : no data
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
Handbook data.
03.04.1997 (57) (123)

Value : < -10 ° C
Decomposition : no at ° C
Sublimation : no
Method : other: no data
Year : 1992
GLP : no data
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
20.05.1994 (6)

2.2 BOILING POINT

Value : = 250 ° C at 1013 hPa
Decomposition : no
Method : other: calculated
Year : 1993
GLP : no
Test substance :
Remark : At 1013 hPa polymerisation occurs at elevated temperatures.
Boiling point cannot be experimentally determined.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
22.08.2001 (94)

Value : = 67 ° C at 4.6 hPa
Decomposition :
Method : other: no data
Year : 1992
GLP : no data
Test substance :
Source : Aldrich-Chemie GmbH & Co.KG, Germany
Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance : Purity: 97 %
Inhibited with 300 ppm hydroquinone monomethyl ether
03.05.1994 (2)

Value : = 68 ° C at 1.33 hPa
Decomposition : no
Method : other: no data
Year : 1978
GLP : no data
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
24.05.1994 (134)

Value : = 95 ° C at 13.3 hPa
Decomposition : no
Method : other: Not specified
Year : 1999
GLP : no
Test substance : other TS: source; not available
Source : MITSUBISHI RAYON CO., LTD.
22.08.2001 (72)

Value : = 211 ° C at 1013 hPa
Decomposition :
Method : other: Not specified
Year :
GLP : no
Test substance : other TS: source; not available
Remark : Pressure: atmospheric pressure
Source : MITSUBISHI RAYON CO., LTD.
22.08.2001 (11)

Value : = 211 ° C at
Decomposition : no
Method : other: no data
Year : 1992
GLP : no data
Test substance :
Remark : Pressure not specified.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
20.05.1994 (6)

Value : ca. 250 ° C at 1013 hPa
Decomposition : no
Method : other: no data
Year : 1996
GLP : no
Test substance :
Remark : At 1013 hPa polymerisation occurs at elevated temperatures.
Boiling point cannot be experimentally determined.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
18.02.1997 (24) (108)

Value : = 250 ° C at 1013 hPa
Decomposition : no
Method : other
Year :
GLP : no data

Test substance :
Remark : Werte laut Lieferanten-Angaben.
Source : TRANSOL Chemiehandel GmbH Essen
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
05.06.1996

2.3 DENSITY

Type : density
Value : = 1.073 g/cm3 at 20° C
Method :
Year :
GLP : no
Test substance : other TS: source; not available
Source : MITSUBISHI RAYON CO., LTD.
Flag : Critical study for SIDS endpoint
18.08.2001 (11)

Type : density
Value : = 1.072 at 20° C
Method : other: no data
Year : 1999
GLP : no data
Test substance : other TS: source; not available
18.08.2001 (72)

Type : density
Value : = 1.07 g/cm3 at 20° C
Method : other: no data
Year : 1993
GLP : no
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
24.05.1994 (94)

Type : density
Value : = 1.07 g/cm3 at 20° C
Method : other: no data
Year : 1996
GLP : no
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
18.02.1997 (108)

Type : relative density
Value : = 1.07 g/cm3 at 20° C
Method : other
Year :
GLP : no data
Test substance :
Method : nach DIN 51 757.
Remark : alle Werte laut Lieferanten-Angaben.
Source : TRANSOL Chemiehandel GmbH Essen
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
05.06.1996

Type : density
Value : = 1.071 g/cm3 at 20° C
Method : other: no data
Year : 1978
GLP : no data
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
24.11.1993 (134)

Type : density
Value : = 1.064 g/cm3 at 25° C
Method : other: no data
Year : 1984
GLP : no data
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
24.05.1994 (56)

Type : density
Value : = 1.064 g/cm3 at 25° C
Method : other: no data
Year : 1984
GLP : no data
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
Handbook data.
03.04.1997 (57)

Type : density
Value : = 1.034 g/cm3 at ° C
Method : other: no data
Year : 1992
GLP : no data
Test substance :
Remark : Temperature: no data
Source : Aldrich-Chemie GmbH & Co.KG, Germany
Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance : Purity: 97 %
Inhibited with 300 ppm hydroquinone monomethyl ether
04.05.1994 (2)

Type : density
Value : = 1.034 g/cm3 at ° C
Method : other: no data
Year : 1992
GLP : no data
Test substance :
Remark : Temperature: no data
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance : Purity: 97 %
Inhibited with 300 ppm hydroquinone monomethyl ether
Reliability : (2) valid with restrictions
Handbook data.

03.04.1997 (2)

2.3.1 GRANULOMETRY

2.4 VAPOUR PRESSURE

Value : = 0.126 mmHg (16.8 Pa) at 25° C
Decomposition :
Method
Year :
GLP : no
Test substance : other TS: source; not available
Source : HSDB DATA BASE
Flag : Critical study for SIDS endpoint
18.08.2001 (18-1)

Value : = .013 hPa at 25° C
Decomposition :
Method
Year :
GLP : no
Test substance : other TS: source; not available
Source : MITSUBISHI RAYON CO., LTD.
:
18.08.2001 (11)

Value : = .01 at 25° C
Decomposition :
Method
Year :
GLP : no data
Test substance : other TS: source; not available
18.08.2001 (132)

Value : = 6.7 hPa at 3.9° C
Decomposition :
Method
Year :
GLP : no
Test substance : other TS: source; not available
Source : MITSUBISHI RAYON CO., LTD.
18.08.2001

Value : = 1.3 hPa at 7.7° C
Decomposition :
Method
Year :
GLP : no
Test substance : other TS: source; not available
Source : MITSUBISHI RAYON CO., LTD.
18.08.2001

Value : ca. .1 hPa at 20° C
Decomposition :
Method

Year : 1993
GLP : no
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
24.05.1994 (94)

Value : ca. .1 hPa at 20° C
Decomposition :
Method
Year : 1996
GLP : no
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
18.02.1997 (108)

Value : = 1300 hPa at 68° C
Decomposition :
Method other (measured)
Year :
GLP : no data
Test substance :
Remark : alle Werte laut Lieferanten-Angaben. Aussagen zur Methode können nicht gemacht werden!
Source : TRANSOL Chemiehandel GmbH Essen
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
05.06.1996

Value : = 13.3 hPa at 95° C
Decomposition :
Method
Year :
GLP : no
Test substance : other TS: source; not available
Source : MITSUBISHI RAYON CO., LTD.
18.08.2001

2.5 PARTITION COEFFICIENT

Log pow : = .42 at 25° C
Method OECD Guide-line 107 "Partition Coefficient (n-octanol/water), Flask-shaking Method"
Year : 1996
GLP : yes
Test substance : other TS: source; Nakaraitesuku Co., Purity: 98.2%
Source : MITSUBISHI RAYON CO., LTD.
Reliability : (1) valid without restriction
Flag : Critical study for SIDS endpoint
18.08.2001 (11)

Log pow : = -.55 at ° C
Method other (measured): HPLC
Year : 1981
GLP : no
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

20.05.1994 (28)

Log pow : = -.53 at ° C
Method other (measured): HPLC
Year : 1981
GLP : no
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
20.05.1994 (28)

Log pow : = -.25 at ° C
Method other (measured): HPLC
Year : 1984
GLP : no
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
23.11.1993 (27)

Log pow : = .24 at ° C
Method
Year : 1992
GLP : no data
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
25.02.1994 (34)

Log pow : = .47 at ° C
Method other (measured): flask shaking method as OECD 107
Year : 1982
GLP : no data
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
24.05.1994 (131)

Log pow : = .49 at ° C
Method other (calculated): according to Rekker
Year : 1977
GLP : no
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
24.05.1994 (90)

Log pow : = 47 at ° C
Method other (measured)
Year :
GLP : no data
Test substance :
Remark : Alle Werte laut Lieferanten-Angaben. Aussagen zur Meß-methode können nicht gemacht werden!_
Source : TRANSOL Chemiehandel GmbH Essen
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
05.06.1996

2.6.1 WATER SOLUBILITY

Value : ≥ 100 g/l at 20 ° C
Qualitative :
Pka : at 25 ° C
PH : at and ° C
Method :
Year :
GLP : no
Test substance : other TS: source not available
Source : MITSUBISHI RAYON CO., LTD.
Flag : Critical study for SIDS endpoint
18.08.2001 (11)

Value : > 100 g/l at ° C
Qualitative :
Pka : at 25 ° C
PH : at and ° C
Method : other: no data
Year : 1992
GLP : no data
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
20.05.1994 (6)

Value : = 100 vol% at ° C
Qualitative :
Pka : at 25 ° C
PH : at and ° C
Method : other
Year :
GLP : no data
Test substance :
Remark : Alle Werte laut Lieferanten-Angaben. Es können keine Aussagen zu Meßmethoden gemacht werde.
Result : Mischbar mit Wasser.
Source : TRANSOL Chemiehandel GmbH Essen
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
05.06.1996

2.6.2 SURFACE TENSION

2.7 FLASH POINT

Value : = 109 ° C
Type :
Method :
Year :
GLP : no
Test substance : other TS: source; not available
Source : MITSUBISHI RAYON CO., LTD.
18.08.2001 (72)

Value : = 96 ° C

Type : closed cup
Method : other: no data
Year : 1988
GLP : no data
Test substance :
Remark : Purity: min 96.5 %
Typical properties: Purity: 97.2 %
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
24.05.1994 (86)

Value : = 97 ° C
Type : closed cup
Method : other: no data
Year : 1987
GLP : no data
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
12.11.1993 (22)

Value : = 97 ° C
Type : closed cup
Method : other: no data
Year : 1987
GLP : no data
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
Handbook data.
03.04.1997 (2)

Value : = 101 ° C
Type : other: no data
Method : other: DIN 51758
Year : 1993
GLP : no
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
24.05.1994 (94)

Value : = 101 ° C
Type : other: no data
Method : other: DIN 51758
Year : 1996
GLP : no
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
18.02.1997 (108)

Value : = 104 ° C
Type : open cup
Method : other: no data
Year : 1988
GLP : no data
Test substance :

Remark : Purity: min 96.5 %
Typical properties: Purity: 97.2 %
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
24.05.1994 (86)

Value : = 107 ° C
Type : other
Method : other
Year :
GLP : no data
Test substance :
Remark : Alle Werte laut Lieferanten-Angaben. Es können keine Aussagen zu den Meßmethoden gemacht werden..
Source : TRANSOL Chemiehandel GmbH Essen
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
05.06.1996

Value : = 108 ° C
Type : open cup
Method :
Year : 1987
GLP : no data
Test substance :
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
Handbook data.
03.04.1997 (57)

2.8 AUTO FLAMMABILITY

2.9 FLAMMABILITY

Result : other
Method : other
Year :
GLP : no data
Test substance :
Method : laut DIN 51 794
Remark : Alle Werte laut Lieferanten-Angaben. Es können keine Alle Werte laut Lieferanten-Angaben. Es können keie Angaben zu den Meßmethoden gemacht werden.
Result : Zündtemperatur 375 Grad C
Source : TRANSOL Chemiehandel GmbH Essen
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
05.06.1996

2.10 EXPLOSIVE PROPERTIES

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

Remark : Alle Werte laut Lieferanten-Angaben. Es können keine Aussagen zu den Meßmethoden gemacht werden.
Result : Untere Explosionsgrenze 1,7 Vol% bei 97,5°C
Source : TRANSOL Chemiehandel GmbH Essen
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
05.06.1996

2.11 OXIDIZING PROPERTIES

2.12 ADDITIONAL REMARKS

Memo : Colour:
Remark : colourless
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
18.02.1997 (108)

Memo : Conversion factors:
Remark : 1 ppm = 0.185 mg/m3
1 mg/m3 = 5.4 ppm
calculated according to MAK, 1996
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
02.04.1997 (21)

Memo : Henry's law constant:
Remark : Value: 1.3016*10exp-3 Pa*m3/mol
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
Accepted calculation method; calculation according to Mackay.
03.04.1997 (64)

Memo : Ordour:
Remark : esterlike
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
18.02.1997 (108)

Memo : Vapour density:
Remark : Value: > 1 at 20 degree C (1=air)
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
18.02.1997 (108)

Memo : Viscosity (dynamic):
Remark : Value: 9 mPa*s at 20 degree C
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
18.02.1997 (108)

Remark : Henry's law constant: 1.3016*10exp-3 Pa*m3/mol (calculated)
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
31.05.1994 (64)

Remark : Vapour density: > 1 at 20 degree C (1=air)
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
24.05.1994 (94)

Remark : Colour: colourles
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
24.05.1994 (94)

Remark : Ordour: esterlike
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
24.05.1994 (94)

Remark : Viscosity (dynamic): 9 mPa*s at 20 degree C
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
24.05.1994 (94)

Remark : Conversion factors: 1 ppm = 0.185 mg/m3
1 mg/m3 = 5.4 ppm
calculated according to MAK, 1993
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
24.05.1994 (66)

Remark : Methacrylates are normally stabilised by addition of phenolic inhibitors during transport and storage. To be effective these inhibitors require the presence of oxygen. Exposure to heat, light, peroxide activators, catalysts or storage without air contact may result in exothermic polymerisation. If the permissible storage period or storage temperature is noticeably exceeded, exothermic polymerisation may occur.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
30.05.1994 (94)

Remark : Methacrylates are normally stabilised by addition of phenolic inhibitors during transport and storage. To be effective these inhibitors require the presence of oxygen. Exposure to heat, light, peroxide activators, catalysts or storage without air contact may result in exothermic polymerisation. If the permissible storage period or storage temperature is noticeably exceeded, exothermic polymerisation may occur.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
18.02.1997 (108)

3.1.1 PHOTODEGRADATION

Type	:	air
Light source	:	Sun light
Light spect.	:	Nm
Rel. intensity	:	based on Intensity of Sunlight
Conc. of subst.	:	at 25 ° C
Indirect photolysis		
Sensitizer	:	OH
Conc. of sens.	:	500000 molecule/cm3
Rate constant	:	= 2.413E-11. cm3/(molecule*sec)
Degradation	:	= 50 % after 16 hour(s)
Deg. Product	:	
Method	:	other (calculated)
Year	:	
GLP	:	no
Test substance	:	
Result	:	Photodegradation is estimated as ca.16 hrs, employing the following calculation model. T1/2(photo air OH)=0.693/(2.413E-11 * 5.0E5)/3600
Source	:	SRC PhysProp Database

3.1.2 STABILITY IN WATER

Type	:	abiotic
t1/2 pH4	:	at degree C
t1/2 pH7	:	at degree C
t1/2 pH9	:	= 10.9 day at 25 degree C
Deg. Product	:	
Method	:	OECD Guide-line 111 "Hydrolysis as a Function of pH"
Year	:	
GLP	:	no
Test substance	:	other TS: source; not available
Method	:	-Preliminary Test a) Water Temperature: 50, 60, 70-C b) Nominal Concentration: ca. 1,000 mg/L c) pH: pH4, pH7 and pH9 d) Number of Replicates: 2 e) Test Period: 5 days -Final Test a) Water Temperature: 50, 60, 70-C b) Nominal Concentration: ca. 1,000 mg/L c) pH: pH9 d) Number of Replicates: 2
Result	:	As a result of the preliminary test, 2-hydroxyethyl methacrylate is not decomposed at 50-70-C and at pH4 and 7 in water after 5 days. Stable (at 25-C)
Source	:	MITSUBISHI RAYON CO., LTD
Reliability	:	(1) valid without restriction
Flag	:	Critical study for SIDS endpoint

18.08.2001 (11)

Type	:	abiotic
t1/2 pH4	:	at degree C
t1/2 pH7	:	= 34 day at 40 degree C
t1/2 pH9	:	= 31.7 hour(s) at 40 degree C

Deg. Product	:	
Method	:	OECD Guide-line 111 "Hydrolysis as a Function of pH"
Year	:	1995
GLP	:	no
Test substance	:	
Remark	:	Hydrolysis is not significant at acid pH.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability	:	(2) valid with restrictions Guideline study, no GLP

18.02.1997 (110)

3.1.3 STABILITY IN SOIL

3.2 MONITORING DATA

3.3.1 TRANSPORT BETWEEN ENVIRONMENTAL COMPARTMENTS

Type	:	adsorption
Media	:	other: soil
Air (level I)	:	
Water (level I)	:	
Soil (level I)	:	
Biota (level II / III)	:	
Soil (level II / III)	:	
Method	:	other: calculated
Year	:	1982
Remark	:	Soil adsorption coefficient, Koc= 42.7 calculated from log Koc = 0.544 log Pow + 1.377. Due to the low Koc, no significant adsorption to soil is anticipated.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

29.05.1994 (62)

3.3.2 DISTRIBUTION

Media	:	air - biota - sediment(s) - soil - water
Method	:	Calculation according Mackay, Level III
Year	:	2001
Method	:	Distributions were calculated with following factors. 2-hydroxyethyl methacrylate molecular weight: 130.14 melting point[C]: -12 vapor pressure[Pa]: 16.8 water solubility[g/m3]: 100 log Kow: 0.42 half life[h]: in air: 16 in water: 360 in soil: 360 in sediment: 1080 temp.[C]: 25

Result : The potential environmental distribution of 2-hydroxyethyl methacrylate obtained from generic level III fugacity model under three emission scenarios is shown in table. The results show that if 2-hydroxyethyl methacrylate is released mainly into water, it is unlikely to distrybute into other compartments. But, if 2-hydroxyethyl methacrylate is released mainly to air, it is likely to be transported both water and soil.

Compartment	Amount % Release 100% to air	Release 100% to water	Release 100% to soil
Air	15.3	0.0	0.1
Water	30.2	99.6	19.6
Soil	54.4	0.0	80.2
Sediment	0.1	0.3	0.1

Source : MITSUBISHI RAYON CO., LTD
Reliability : (1) valid without restriction
Flag : Critical study for SIDS endpoint
18.08.2001

Media : air - biota - sediment(s) - soil - water
Method : Calculation according Mackay, Level I
Year : 1993
Result : volume z density amount conc. conc.
[m3] [mol/m3xPa] [kg/m3] [mol] [%] [ug/g] [ug/m3]
1 air:
6.00E+9 4.0342E-4 1.19 4.50E-2 0.04 8.22E-7 9.755E-4
2 water:
7.00E+6 7.6829E+2 1000.00 9.99E+1 99.91 1.86E-3 1.858E+3
3 soil:
4.50E+4 2.7957E+1 1500.00 2.34E-2 0.02 4.51E-5 6.760E+1
4 sediment:
2.10E+4 5.5913E+1 1500.00 2.18E-2 0.02 9.01E-5 1.352E+2
5 susp aquat mat:
3.50E+1 5.5913E+1 1500.00 3.64E-5 0.00 9.01E-5 1.352E+2
6 biota:
7.00 1.0883E+2 1000.00 1.42E-5 0.00 2.63E-4 2.632E+2

Total 1.00E+2 100.00

Fugacity: 1.858E-08 Pa
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance : Compound properties:
Molecular weight : 130.2 g/mol
Aqueous solubility : 1.0 E+06 g/m3 or 7.683 E+03 mol/m3
Vapour pressure : 1.000 E+01 Pa or 9.869 E-05 atm 7.501 E-02 mmHg
Henry's constant : 1.3016 E-03 Pa x m3/mol
Octanol-water part coeff.(log): 0.47 or 3. part coeff.
Temperature : 25.0 deg C or 298.2 K
24.05.1994 (64)

Media : air - biota - sediment(s) - soil - water
Method : Calculation according Mackay, Level I
Year : 1993

Result : volume z density amount conc. conc.
[m3] [mol/m3xPa] [kg/m3] [mol] [%] [ug/g] [ug/m3]
1 air:
6.00E+9 4.0342E-4 1.19 4.50E-2 0.04 8.22E-7 9.755E-4
2 water:
7.00E+6 7.6829E+2 1000.00 9.99E+1 99.91 1.86E-3 1.858E+3
3 soil:
4.50E+4 2.7957E+1 1500.00 2.34E-2 0.02 4.51E-5 6.760E+1
4 sediment:
2.10E+4 5.5913E+1 1500.00 2.18E-2 0.02 9.01E-5 1.352E+2
5 susp aquat mat:
3.50E+1 5.5913E+1 1500.00 3.64E-5 0.00 9.01E-5 1.352E+2
6 biota:
7.00 1.0883E+2 1000.00 1.42E-5 0.00 2.63E-4 2.632E+2

Total 1.00E+2 100.00

Fugacity: 1.858E-08 Pa

These calculations suggest that the large majority of 2-Hydroxyethyl methacrylate will be found in water. Negligible partitioning of the 2-HEMA to atmosphere, soil, sediment, suspended soils or biota would be expected to occur.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Test substance : Compound properties:
Molecular weight : 130.2 g/mol
Aqueous solubility : 1.0 E+06 g/m3 or 7.683 E+03 mol/m3
Vapour pressure : 1.000 E+01 Pa or 9.869 E-05 atm 7.501 E-02 mmHg
Henry's constant : 1.3016 E-03 Pa x m3/mol
Octanol-water part coeff.(log): 0.47 or 3. part coeff.
Temperature : 25.0 deg C or 298.2 K

Reliability : (2) valid with restrictions
Accepted calculation method; calculation according to Mackay.

03.04.1997 (64)

3.4 MODE OF DEGRADATION IN ACTUAL USE

Remark : Sewage treatment: Waste water containing HEMA entering chemical drains will undergo complete biotic degradation in sewage treatment processes.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

29.05.1994

3.5 BIODEGRADATION

Type : aerobic
Inoculum : other
Concentration : 100mg/l related to Test substance related to

Contact time	:	14 day
Degradation	:	ca. 92 - 100 % after 14 day
Result	:	
Deg. Product	:	
Method	:	other: MITI (I) Method (1974), cprresponding to the OECD 301C (1981).
Year	:	1989
GLP	:	yes
Test substance	:	other TS: Tokyo Kasei Kogyo, Purity: 95.0 %
Method	:	-Test Substance: a)Degree of Purity: >=95.0% -Test Conditions: a)Water Temperature: 24-26-C b)Inoculum: standardized activated sludge, 30 mg/L as suspended solid c)Exposure Vessel Type: 300 mL culture bottle d)Number of Replicate: 3
Source	:	MITSUBISHI RAYON CO., LTD
Reliability	:	(1) valid without restriction
Flag	:	Critical study for SIDS endpoint

18.08.2001 (10)

Type	:	aerobic
Inoculum	:	activated sludge
Concentration	:	100mg/l related to COD (Chemical Oxygen Demand) related to
Contact time	:	
Degradation	:	= 92 - 100 % after 14 day
Result	:	readily biodegradable
Deg. Product	:	
Method	:	OECD Guide-line 301 C "Ready Biodegradability: Modified MITI Test (I)"
Year	:	1992
GLP	:	no data
Test substance	:	no data
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

21.03.1994 (6)

Type	:	aerobic
Inoculum	:	activated sludge, domestic
Concentration	:	related to COD (Chemical Oxygen Demand) related to
Contact time	:	
Degradation	:	= 84 % after 28 day
Result	:	readily biodegradable
Kinetic of test substance	:	2 day = 0 **%** 3 day = 2.1 **%** 10 day = 43.8 **%** 15 day = 63.9 **%** 25 day = 84 **%**
Deg. Product	:	
Method	:	OECD Guide-line 301 D "Ready Biodegradability: Closed Bottle Test"
Year	:	1993
GLP	:	no
Test substance	:	as prescribed by 1.1 - 1.4
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

15.04.1994 (99)

Type : aerobic
Inoculum : activated sludge, domestic
Concentration : related to COD (Chemical Oxygen Demand)
related to
Contact time :
Degradation : = 84 % after 28 day
Result : readily biodegradable
Kinetic of test substance : 2 day = 0 **%**
3 day = 2.1 **%**
10 day = 43.8 **%**
15 day = 63.9 **%**
25 day = 84 **%**
Deg. Product :
Method : OECD Guide-line 301 D "Ready Biodegradability: Closed Bottle Test"
Year : 1993
GLP : no
Test substance : as prescribed by 1.1 - 1.4
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
18.02.1997 (120)

Type : aerobic
Inoculum : activated sludge, domestic
Concentration : related to DOC (Dissolved Organic Carbon)
related to
Contact time :
Degradation : = 98 % after 28 day
Result : readily biodegradable
Kinetic of test substance : 3 hour(s) = 3 - 4 **%**
1 day = 7 - 17 **%**
6 day = 77 - 80 **%**
10 day = 97 - 99 **%**
%
Deg. Product :
Method : OECD Guide-line 301 E "Ready biodegradability: Modified OECD Screening Test"
Year : 1988
GLP : no
Test substance : as prescribed by 1.1 - 1.4
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance : Purity: 99.6 %
15.04.1994 (97)

Type : aerobic
Inoculum : activated sludge, domestic
Concentration : related to DOC (Dissolved Organic Carbon)
related to
Contact time :
Degradation : = 98 % after 28 day
Result : readily biodegradable
Kinetic of test substance : 3 hour(s) = 3 - 4 **%**
1 day = 7 - 17 **%**
6 day = 77 - 80 **%**
10 day = 97 - 99 **%**
%

Deg. Product :
Method : OECD Guide-line 301 E "Ready biodegradability: Modified OECD Screening Test"
Year : 1988
GLP : no
Test substance : as prescribed by 1.1 - 1.4
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance : Purity: 99.6 %
18.02.1997 (118)

Type : aerobic
Inoculum :
Contact time :
Degradation : 90 - 100 % after
Result : other
Method : OECD 301 E/EEC 84/449
Remark : Alle Werte laut Lieferanten-Angaben. Es können keine Aussagen zu den Meßmethoden gemacht werden.
Result : leicht biolog. abbaubar
Source : TRANSOL Chemiehandel GmbH Essen
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
05.06.1996

3.6 BOD5, COD OR BOD5/COD RATIO

3.7 BIOACCUMULATION

BCF : = 1.34 - 1.54
Elimination :
Method : other: according to Lyman et al.
Year : 1982
GLP : no data
Test substance :
Remark : calculated using equation log BCF = 0.76 log Pow - 0.23
No bioaccumulation potential is predicted from the n-octanol-water partition coefficient.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
29.05.1994 (62)

BCF : = 1.34 - 1.54
Elimination :
Method : other: according to Lyman et al.
Year : 1982
GLP : no data
Test substance :
Remark : calculated using equation log BCF = 0.76 log Pow - 0.23
No bioaccumulation potential is predicted from the n-octanol-water partition coefficient.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
Accepted calculation method.
03.04.1997 (62)

3.8 ADDITIONAL REMARKS

4.1 ACUTE/PROLONGED TOXICITY TO FISH

Type	:	semistatic
Species	:	Oryzias latipes (Fish, fresh water)
Exposure period	:	96 hour(s)
Unit	:	mg/l
Analytical monitoring	:	yes
LC50	:	m > 100
Method	:	OECD Guide-line 203 "Fish, Acute Toxicity Test"
Year	:	1996
GLP	:	yes
Test substance	:	other TS: source; Wako Pure Chemical Ind., Puritu; 97.2%
Method	:	-Test Organisms: a) Size (length and weight): length = 20 - 21 mm; weight = 0.13 - 0.15 g b) Supplier / Source: obtained from commercial hatcheries -Test Conditions: a) Dilution Water Source: Dechlorination water b) Dilution Water Chemistry: hardness=55.6mg/L CaCO3, pH=7.7, chlorine concentration < 0.02mg/L c) Exposure Vessel Type: 2.5L test solution in a 3 L-glass vessel d) Nominal Concentrations (as mg/L): 100 e) Vehicle / Solvent and Concentrations: Not used f) Stock Solutions Preparations and Stability: The material of a necessary amount is dissolved to the dilution water, and examination field liquid 10,000mg/L is adjusted. g) Number of Replicates: 2 h) Fish per Replicates: 10 i) Renewal Rate of Test Water: water renewal; 48 hours j) Water Temperature: 23.9-24.4 degree C k) Lighting Condition: 16:8 hours; light-darkness cycle l) Feeding: Not feeding -Method of Analytical Monitoring: The tested concentrations were measured at 0 hour and 48 hours (in advance of test solution exchange) by gas chromatography method. -Statistical Method: a) Data Analysis: Not described b) Method of Calculating Mean Measured Concentrations (i.e. arithmetic mean, geometric mean, etc.): Time -weighted means
Result	:	-Measured Concentrations (as mg/L): See Table 1 -Water chemistry in test (O2, pH) in the control and one concentration where effects were observed: pH 6.8-7.5; DO = 5.5-8.2 mg/L(Oxygen saturation level >=60%) -Cumulative Mortality: See Table 2 -Stastical Result: Not described
Source	:	MITSUBISHI RAYON CO., LTD
Attached doc.	:	Table 1 Table 2

Table 1 : Measured concentrations (as mg/L):

Nominal concentration	Measured concentration (mg/L) (Percentage of nominal)		
(mg/L)	0 hour	48 hours	Time-weighted mean
Control	n. d.	n. d.	n. d.
100	103(103)	99.1(99.1)	101(101)

n. d. : < 2.50 mg/L

Table 2 : Cumulative Mortality

Nominal concentration (mg/L)	Cumulative number of dead fish (Percent mortality)			
	0 hour	24 hours	48 hours	96 hours
Control	0(0)	0(0)	0(0)	0(0)
100	0(0)	0(0)	0(0)	0(0)

Reliability : (1) valid without restriction
Flag : Critical study for SIDS endpoint
18.08.2001 (25)

Type : flow through
Species : Oryzias latipes (Fish, fresh water)
Exposure period : 14 day
Unit : mg/l
Analytical monitoring : yes
LC_0 : m = 25 (Abnormal behaviour and reduced feeding activity were observed at 50 mg/L and 100 mg/L.)

LC50 : m > 100
Method : OECD Guide-line 204 "Fish, Prolonged Toxicity Test: 14-day Study"
Year : 1996
GLP : yes
Test substance : other TS: source; Wako Pure Chemical Ind., Puritu; 97.2%
Method : -Test Organisms:
a) Size (length and weight): length = 17 - 20 mm; weight = 0.064 - 0.12 g
b) Supplier / Source: obtained from commercial hatcheries
c) Pretreatment: 12 days pretreatment with same condition of the test

-Test Conditions:
a) Dilution Water Source: Dechlorination water
b) Dilution Water Chemistry: hardness=55.6mg/L CaCO3, pH=7.7, chlorine concentration<0.02mg/L
c) Exposure Vessel Type: 1.8L test solution in a 3 L-glass vessel
d) Nominal Concentrations (as mg/L): 6.25, 12.5, 25, 50 and 100 mg/L
e) Vehicle / Solvent and Concentrations: Not used
f) Stability of the Test Chemical Solutions: Confirmed by the infrared rays absorption spectrum.
g) Number of Replicates: 1
h) Individuals per Replicate: 10
i) Details of Test: flow-through
j) Flow-through Rate: 25.0mL/min.(test substance: 2.5mL/min., dilution water : 22.5mL/min.)

k) Water Temperature: 23.6-24.4 degree C
l) Light Condition: 16:8 hours; light-darkness cycle

-Metod of Anlytical Monitoring:
The tested concentrations were measured at 0 , 7day and 14 day by gas chromatography method.

-Statistical Method:
a) As the mortality of the test fish is not over 50% at highest concentration, LC50 is higher the highest concentration.

Result : -Measured Concentration: See Table 1
Source : MITSUBISHI RAYON CO., LTD
Attached doc. : Table 1
Table 2

Table 1 : Measured Concentration

Nominal concentration (mg/L)	Measured concentration (mg/L) (Percentage of nominal)			
	0 day	7 day	14 days	Time-weighted mean
Control	n. d.	n. d.	n. d.	n. d.
6.25	5.85(93.6)	5.77(92.3)	6.35(102)	5.99(95.8)
12.5	12.2(97.9)	12.1(96.9)	11.9(95.1)	12.1(96.6)
25	24.7(98.9)	21.3(85.0)	23.1(92.3)	23.0(92.1)
50	49.5(98.9)	46.3(92.6)	47.4(94.8)	47.7(95.5)
100	101(101)	97.1(97.1)	95.8(95.8)	97.8(97.8)

n. d.: < 2.50 mg/L

Table 2 : Cumulative Mortality

Nominal concentration (mg/L)	Cumulative number of dead fish (Percent mortality)		
	0 days	7 days	14 days
Control	0(0)	0(0)	0(0)
6.25	0(0)	0(0)	0(0)
12.5	0(0)	0(0)	0(0)
25	0(0)	0(0)	0(0)
50	0(0)	0(0)	1 (10)
100	0(0)	0(0)	1 (10)

Reliability : (1) valid without restriction
Flag : Critical study for SIDS endpoint
18.08.2001 (25)

Type : flow through
Species : Pimephales promelas (Fish, fresh water)
Exposure period : 96 hour(s)
Unit : mg/l
Analytical monitoring : yes
LC50 : = 227
EC50 : = 227
Method :
Year : 1986
GLP : no
Test substance :
Remark : Affected fish lost schooling behavior and swam near the tank surface. They were hyperactive and overreactive to external stimuli, had increased respiration, were darkly coloured, and lost equilibrium prior to death.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Test condition	:	Temperature : 24.7 degree C Hardness : 45.9 mg/l (CaCO3) Dissolved Oxygen: 6.7 mg/l pH-Value : 7.70
Test substance	:	Purity: 98.5 %

29.05.1994 (31) (106)

Type	:	flow through
Species	:	Pimephales promelas (Fish, fresh water)
Exposure period	:	96 hour(s)
Unit	:	mg/l
Analytical monitoring	:	yes
LC50	:	= 227
EC50	:	= 227
Method	:	
Year	:	1986
GLP	:	no
Test substance	:	
Remark	:	Affected fish lost schooling behavior and swam near the tank surface. They were hyperactive and overreactive to external stimuli, had increased respiration, were darkly coloured, and lost equilibrium prior to death.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test condition	:	Temperature : 24.7 degree C Hardness : 45.9 mg/l (CaCO3) Dissolved Oxygen: 6.7 mg/l pH-Value : 7.70
Test substance	:	Purity: 98.5 %
Reliability	:	(2) valid with restrictions Guideline study with acceptable restrictions.

10.03.1997 (32) (106)

Type	:	other: no data
Species	:	Carassius auratus (Fish, fresh water)
Exposure period	:	72 hour(s)
Unit	:	mg/l
Analytical monitoring	:	no
LC50	:	= 374.5
Method	:	other: no data
Year	:	1975
GLP	:	no
Test substance	:	no data
Remark	:	Density: 1.07 g/cm3
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

15.11.1993 (82)

Type	:	static
Species	:	Leuciscus idus melanotus (Fish, fresh water)
Exposure period	:	48 hour(s)
Unit	:	mg/l
Analytical monitoring	:	no
LC0	:	= 250
LC50	:	= 360
LC100	:	= 400
Method	:	other: DIN 38412 Teil 15
Year	:	1988
GLP	:	no

Test substance	:	as prescribed by 1.1 - 1.4
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance	:	Purity: 99.6 %

15.04.1994

Type	:	static
Species	:	Leuciscus idus melanotus (Fish, fresh water)
Exposure period	:	48 hour(s)
Unit	:	mg/l
Analytical monitoring	:	no
LC0	:	= 250
LC50	:	= 360
LC100	:	= 400
Method	:	other: DIN 38412 Teil 15
Year	:	1988
GLP	:	no
Test substance	:	as prescribed by 1.1 - 1.4
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance	:	Purity: 99.6 %

18.02.1997 (116)

Type	:	other
Species	:	Pimephales promelas (Fish, fresh water)
Exposure period	:	96 hour(s)
Unit	:	mg/l
Analytical monitoring	:	no data
LC50	:	= 227
Method	:	other
Year	:	
GLP	:	no data
Test substance	:	as prescribed by 1.1 - 1.4
Remark	:	Alle Werte laut Lieferanten-Angaben. Es können keine Aussagezu den Meßmethoden gemacht werden.
Source	:	TRANSOL Chemiehandel GmbH Essen EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

05.06.1996

4.2 ACUTE TOXICITY TO AQUATIC INVERTEBRATES

Type	:	static
Species	:	Daphnia magna (Crustacea)
Exposure period	:	48 hour(s)
Unit	:	mg/l
Analytical monitoring	:	yes
NOEC	:	m = 171 (determined based on immobility)
EC50	:	m = 380
Method	:	OECD Guide-line 202, part 1 "Daphnia sp., Acute Immobilisation Test"
Year	:	1996
GLP	:	yes
Test substance	:	other TS: source; Wako Pure Chemical Ind., Puritu; 97.2%
Method	:	-Test Organisms: a) Age at Study Initiation: < 24 hours after hatching b) Supplier/Source: Supplied from U.S. EPA Environmental Research Laboratory -Test Conditions:

a) Dilution Water Source: Dechlorination water
b) Dilution Water Chemistry: hardness=55.6mg/L CaCO3, pH=7.7, chlorine concentration<0.02mg/L
c) Exposure Vessel Type: Petri dish (diameter = 8.5 cm, depth = 5.7 cm)
d) Nominal concentrations (as mg/L): 95.3, 171, 309, 556, 1000
e) Stock Solutions Preparation and Stability: The material of a necessary amount is dissolved to the dilution water, and examination field liquid 10,000mg/L is adjusted.
f) Numeber of Replicate: 4
g) Individuals per Replicate: 20
h) Water Temerature Range: 20.0 - 20.2 degree C
i) Light Conditions: 16:8 hours; light darkness cycle

Result : -Measured Concentrations: See Table 1

-Water Chemistry in Test: See Table 2

-Number Immobility as Compared to the Number Exposed: See Table 3

-Statistical Result: Not described

Attached doc. : Table 1
Table 2
Table 3

Table 1 : Measured Concentrations

Nominal concentration	Measured concentration (mg/L) (Percentage of nominal)		
(mg/L)	0 hour	48 hours	Time-weighted mean
Control	n. d.	n. d.	n. d.
95.3	99.5(104)	94.4(99.1)	97.0(102)
171	178(104)	175(102)	177(103)
309	319(103)	317(103)	318(103)
556	577(104)	558(100)	568(102)
1,000	1010(101)	1010(101)	1010(101)

n. d. :<5.00 mg/L

Table 2 : Water Chemistry in Test

Nominal concentration	Measured value			
	DO (mg/L)		pH	
(mg/L)	0 hour	48 hours	0 hour	48 hours
Control	8.7	8.4	8.0	7.6
95.3	8.7	8.4	7.2	7.2
171	8.6	8.4	6.9	7.1
309	8.6	8.4	6.8	7.1
556	8.6	8.4	6.7	7.1
1,000	8.6	8.5	6.7	7.0

Table 3 : Number Immobility as Compared to the Number Exposed

Nominal concentration (mg/L)	Cumulative number of immobilized *Daphnia* (Percentage immobility)	
	24 hours	48 hours
Control	0(0)	0(0)
95.3	0(0)	0(0)
171	0(0)	0(0)
309	0(0)	3(15)
556	8(40)	20(100)
1,000	20(100)	20(100)

Reliability : (1) valid without restriction
Flag : Critical study for SIDS endpoint
18.08.2001

4.3 TOXICITY TO AQUATIC PLANTS E.G. ALGAE

Species : Selenastrum capricornutum (Algae)
Endpoint : growth rate
Exposure period : 72 hour(s)
Unit : mg/l
Analytical monitoring : yes
NOEC : m = 160 (determined based on inhibition)
EC50 : m = 345
Method : OECD Guide-line 201 "Algae, Growth Inhibition Test"
Year : 1996
GLP : yes
Test substance : other TS: source; Wako Pure Chemical Ind., Purity; 97.2%
Method : -Test Organisms:
a) Supplier / Source (Strain Number): Selenastrum capricornutum ATCC22662

-Test Conditions:
a) Test Medium: OECD medium
b) Exposure Vessel Type: 100 ml-medium in a 500 ml-erlenmeyer flask with a silicon cap which allow ventilation
c) Nominal Concentrations (as mg/L): 25.6, 64.0, 160, 400 and 1,000 mg/L
d) Stock Solutions Preparations and Stability: The medium dissolved by the material, and the examination field liquid of 2,000mg/L is adjusted, inadditon the filtration sterilization was done with 0.45um membrane filter.
e) Number of Replicates: Triplicate
f) Initial Cell Number: 10000 cells/mL
g) Water Temperature Range: 23.2 - 23.7 degree C
h) Light Condition: 4200 - 4500 lux, continuous

-Method of Analytical Monitoring:
The tested concentrations were measured by gas chromatography method.

-Statistical Method:
a) Data Analysis: Least squares method for EC, Dunnett test for NOEC
b) Method of calculating mean measured concentrations: Time -weighted means

Result : -Measured Concentrations (as mg/L):
n. d. (<5.00) for control, 22.9-26.0 for the nominal concentration of 25.6, 57.1-65.7 for the nominal concentration of 64.0, 144-162 for the nominal concentration of 160, 391-410 for the nominal concentration of 400, and 994-1,020 for the nominal concentration of 1,000.

-Water Chemistry in Test (pH): See Table 1

-Cell Density at Each Flask at Each Measuring Point: See Table 2 and Table 3

-Growth Curves:
Logarithmic growth until end of the test

-Stastical Result: Not described

Attached doc. : Table 1
Table 2
Table 3

Table 1 : Water Chemistry in Test (pH)

Nominal concentration(mg/L)	pH	
	0 hour	72 hours
Control	7.9	10.4
25.6	7.9	10.1
64.0	7.9	10.0 8.6 10.1
160	7.9	10.0
400	7.9	8.7
1,000	7.9	8.1

Table 2 : Growth inhibition of *Selenastrum capricornutum* during 72-hour exposure to 2-hydroxyethyl methacrylate

Nominal Concentration (mg/L)	No.	Area (*10,000) (0-72 h)	Inhibition (%) (0-72 h)
Control	1	1860	-
	2	1460	-
	3	1530	-
	Average	1620	
25.6	1	1890	-17.0
	2	1500	7.31
	3	1860	-15.2
	Average	1750	-8.29
64	1	1830	-12.8
	2	1050	35.1
	3	1730	-6.88
	Average	1540	5.11
160	1	1670	-2.89
	2	1580	2.54
	3	1590	1.55
	Average	1610	0.398
400	1	756	53.3
	2	661	59.2
	3	707	56.3
	Average	708	56.3
1000	1	80.9	95.0
	2	94.0	94.2
	3	95.9	94.1
	Average	90.3	94.4

Table 3 : Cell density of *Selenastrum capricornutum* during 72-hour exposure to 2-hydroxyethyl methacrylate

Nominal concentration (mg/L)	Cell density (*10,000 cells/mL)				
	No.	0-hour	24-hour	48-hour	72-hour
control	1	1.0	4.8	29.4	91.4
	2	1.0	4.0	25.7	67.6
	3	1.0	5.0	23.9	74.9
	Average	1.0	4.6	26.3	78.0
	S.D.	0.0	0.5	2.8	12.2
25.6	1	1.0	3.8	29.9	95.4
	2	1.0	3.7	25.6	71.5
	3	1.0	3.9	28.8	94.9
	Average	1.0	3.8	28.1	87.3
	S.D.	0.0	0.1	2.2	13.7
64.0	1	1.0	3.4	26.9	96.5
	2	1.0	3.6	21.7	41.9
	3	1.0	3.2	27.2	88.5
	Average	1.0	3.4	25.2	75.6
	S.D.	0.0	0.2	3.1	29.5
160	1	1.0	3.4	27.9	81.1
	2	1.0	2.6	26.6	78.0
	3	1.0	2.9	24.3	83.4
	Average	1.0	3.0	26.2	80.9
	S.D.	0.0	0.4	1.8	2.7
400	1	1.0	2.1	15.0	33.8
	2	1.0	1.9	13.9	28.3
	3	1.0	1.8	12.5	35.2
	Average	1.0	2.0	13.8	32.4
	S.D.	0.0	0.1	1.3	3.6
1000	1	1.0	1.3	2.6	3.8
	2	1.0	1.2	3.4	3.6
	3	1.0	1.3	3.3	3.8
	Average	1.0	1.3	3.1	3.7
	S.D.	0.0	0.1	0.4	0.1

Reliability : (1) valid without restriction
Flag : Critical study for SIDS endpoint

18.08.2001 (25)

4.4 TOXICITY TO MICROORGANISMS E.G. BACTERIA

Type	:	
Species	:	Photobacterium phosphoreum (Bacteria)
Exposure period	:	
Unit	:	mg/l
Analytical monitoring	:	no data
EC50	:	= 2204
Method	:	other: Leuchtbakterientest, DIN 38412 Teil 34
Year	:	1992
GLP	:	no
Test substance	:	as prescribed by 1.1 - 1.4
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

15.04.1994 (98)

Type	:	
Species	:	Photobacterium phosphoreum (Bacteria)
Exposure period	:	
Unit	:	mg/l
Analytical monitoring	:	no data
EC50	:	= 2204
Method	:	other: Leuchtbakterientest, DIN 38412 Teil 34
Year	:	1992
GLP	:	no
Test substance	:	as prescribed by 1.1 - 1.4
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

18.02.1997 (119)

Type	:	
Species	:	Pseudomonas fluorescens (Bacteria)
Exposure period	:	16 hour(s)
Unit	:	mg/l
Analytical monitoring	:	no
EC0	:	> 3000
Method	:	other: growth inhibition test DEV L8 (Deutsches Einheitsverfahren)
Year	:	1988
GLP	:	no
Test substance	:	as prescribed by 1.1 - 1.4
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance	:	Purity: 99.6 %

15.04.1994 (96)

Type	:	
Species	:	Pseudomonas fluorescens (Bacteria)
Exposure period	:	16 hour(s)
Unit	:	mg/l
Analytical monitoring	:	no
EC0	:	> 3000
Method	:	other: growth inhibition test DEV L8 (Deutsches Einheitsverfahren)
Year	:	1988
GLP	:	no
Test substance	:	as prescribed by 1.1 - 1.4
Source	:	Roehm GmbH Darmstadt

EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance : Purity: 99.6 %
18.02.1997 (117)

Type :
Species :
Exposure period : 3 hour(s)
Unit : mg/l
Analytical monitoring : no data
EC50 : = 8560
Method : other: TTC test according to DEV L3 (Deutsches Einheitsverfahren)
Year : 1993
GLP : no
Test substance : as prescribed by 1.1 - 1.4
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
21.03.1994 (100)

Type :
Species :
Exposure period : 3 hour(s)
Unit : mg/l
Analytical monitoring : no data
EC50 : = 8560
Method : other: TTC test according to DEV L3 (Deutsches Einheitsverfahren)
Year : 1993
GLP : no
Test substance : as prescribed by 1.1 - 1.4
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
18.02.1997 (120)

Type : other
Species : Pseudomonas fluorescens (Bacteria)
Exposure period : 16 hour(s)
Unit : mg/kg soil dw
Analytical monitoring : no data
EC10 : > 3000
Method : other
Year :
GLP : no data
Test substance :
Remark : Alle Werte laut Lieferanten-Angaben. Es können keine Aussagen zu den Meßmethoden gemacht werden.
Source : TRANSOL Chemiehandel GmbH Essen
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
05.06.1996

4.5.1 CHRONIC TOXICITY TO FISH

4.5.2 CHRONIC TOXICITY TO AQUATIC INVERTEBRATES

Species : Daphnia magna (Crustacea)
Endpoint : reproduction rate
Exposure period : 21 day
Unit : mg/l

Analytical monitoring	:	yes
NOEC	:	m = 24.1 (determined based on the average cumulative number of juveniles)
LCEC	:	m = 49.6
EC50	:	m = 90.1
LC50	:	m > 100
Method	:	other: OECD Guide-line 211
Year	:	1996
GLP	:	yes
Test substance	:	other TS: source; Wako Pure Chemical Ind., Puritu; 97.2%
Method	:	-Test Organisms: a) Age at Study Initiation: < 24 hours after hatching b) Supplier/Source: Supplied from U.S. EPA Environmental Research Laboratory -Test Conditions: a) Dilution Water Source: Dechlorination water b) Dilution Water Chemistry: hardness=55.6mg/L CaCO3, pH=7.7, chlorine concentration<0.02mg/L c) Exposure Vessel Type: 0.8 L-test solution in a 1 L-glass vessel d) Nominal Concentrations (as mg/L): 6.25, 12.5, 25.0, 50.0and 100 e) Stock solutions preparation and stability: Not used f) Number of Replicates: 4 g) Individuals per Replicate: 10 h) Test Details: Semi-static i) Renewal Rate of Test Water: not describe j) Water Temperature Range: 19.8 - 20.4 degree C k) Light Condition: 16:8 hours; light darkness cycle m) Feeding: Daphids were fed green algae (Chlorella vulgaris); 0.1 - 0.2 mgC/day/individual -Method of Analytical Monitoring: The tested concentrations were measured by gas chromatography method. -Statistical Method: a) Data Analysis: Kruskal-Wallis test b) Method of Calculating Mean Measured Concentrations (i.e. arithmetic mean, geometric mean, etc.): Time-weighted means
Result	:	-Measured Concentraitons (as mg/L): See Table 1 -Water Chemistry in Test(pH and DO): See Table 2 -Cumulative Numbers of Dead Parental Daphnia: See Table 3 -Time of the First Production of Young (d): 7 days -Mean Cumulative Numbers of Young Produced per Adult: See Table 4 -Statistical Result: Not described
Attached doc.	:	Table 1 Table 2 Table 3 Table 4

Table 1 : Measured Concentrations

Nominal concentration (mg/L)	Concentration of 2-hydroxyethyl methacrylate (mg/L)	
	Range	Mean
Control	n. d.	n. d.
6.25	5.14 – 5.86	5.44
12.5	10.8 – 12.0	11.7
25	22.7 – 24.7	24.1
50	47.3 – 50.7	49.6

Table 2: Water Chemistry in Test

Nominal concentration (mg/L)	Measured value	
	DO (mg/L)	pH
Control	7.9 - 8.9	7.3 - 7.8
5.44	7.8 - 8.9	7.1 - 7.7
11.7	7.6 – 8.9	7.0 - 7.7
24.1	7.4 – 8.9	6.9- 7.6
49.6	7.2 – 8.9	6.9- 7.6
100	7.6 – 8.9	6.9- 7.6

Table 3 : Cumulative Numbers of Dead Parental Daphnia

Measured concentration (mg/L)	Cumulative number of dead parental *Daphnia*		
	Exposure time (day)		
	7	14	21
Control	0(0)	0(0)	0(0)
5.44	0(0)	0(0)	0(0)
11.7	0(0)	0(0)	1(2.5)
24.1	0(0)	0(0)	0(0)
49.6	0(0)	0(0)	0(0)
100	0(0)	0(0)	0(0)

Table 4 : Mean Cumulative Numbers of Young Production per Adult

Measured concentration (mg/L)	Mean cumulative numbers of young produced per adult for 21 days
Control	138
5.44	139
11.7	130
24.1	127
49.6	118
100	59.6

Reliability : (1) valid without restriction
Flag : Critical study for SIDS endpoint
18.08.2001 (25)

4.6.1 TOXICITY TO SOIL DWELLING ORGANISMS

4.6.2 TOXICITY TO TERRESTRIAL PLANTS

4.6.3 TOXICITY TO OTHER NON-MAMM. TERRESTRIAL SPECIES

Species : other avian: Red-winged blackbird (Agelaius phoeniceus)

Endpoint	:	other: acute oral toxicity
Exposure period	:	
Unit	:	mg/kg bw
LD50	:	= 98
Method	:	other: according to DeCino et al. (1966), Schafer (1972), and Schafer et. al. (1967)
Year	:	1983
GLP	:	no data
Test substance	:	no data
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

24.05.1994 (124)

4.7 BIOLOGICAL EFFECTS MONITORING

4.8 BIOTRANSFORMATION AND KINETICS

4.9 ADDITIONAL REMARKS

5.1.1 ACUTE ORAL TOXICITY

Type	:	LD50
Species	:	rat
Strain	:	
Sex	:	
Number of animals	:	
Vehicle	:	
Value	:	= 8700 mg/kg bw
Method	:	other: no data
Year	:	1988
GLP	:	no data
Test substance	:	
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance	:	Purity: min 96.5 % Typical properties: Purity: 97.2 %

22.11.1993 (86)

Type	:	LD50
Species	:	rat
Strain	:	
Sex	:	
Number of animals	:	
Vehicle	:	
Value	:	= 5564 mg/kg bw
Method	:	other: in accordance with Appraisal of the safety of chemicals in foods, drugs and cosmetics, FDA 1959
Year	:	1978
GLP	:	no
Test substance	:	as prescribed by 1.1 - 1.4
Remark	:	Dose response: Dose (mg/kg) deaths 3403 1/10 4259 1/10 5350 4/10 6741 8/10 Symptoms: dose related reduction of activity, tremor, disturbances of coordination, gait, reduced muscle tonus in limbs, elevated body temperature, pilorection. Symptoms appeared 10 min to 24 hours after application of the test substance and were completely reversible in the surviving animals thereafter. No substance related histopathological changes were observed.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

18.02.1997 (113)

Type	:	LD50
Species	:	rat
Strain	:	
Sex	:	
Number of animals	:	
Vehicle	:	
Value	:	= 5050 mg/kg bw
Method	:	other: no data
Year	:	1989

GLP : no data
Test substance : no data
Remark : Russian original literature.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
03.02.1997 (105)

Type : LD50
Species : rat
Strain :
Sex :
Number of animals :
Vehicle :
Value : = 11200 mg/kg bw
Method : other: no data
Year : 1984
GLP : no data
Test substance : no data
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
03.02.1997 (57)

Type : LD50
Species : rat
Strain :
Sex :
Number of animals :
Vehicle :
Value : > 4000 mg/kg bw
Method : other: Limit test
Year : 1966
GLP : no
Test substance :
Result : Neither gross nor microscopic abnormality was detected post mortem but the brain was not examined microscopically.
A further group of three male and three female rats were given single doses of 4000 mg/kg of undiluted material and killed 24 hours later. These animals also showed no ill-effects during life but, at necropsy, all had haemorrhages in the pyloric region of the stomach.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test condition : Number of animals: 6; 3 male and 3 female
Application: 50 % aqueous solution
Observation: 7 days
Test substance : Impurities: 0.5 % diester
1.25 % water
1.0 % ethylene glycol
Stabilization: 200 ppm methyl ether of hydrochinon
Reliability : (2) valid with restrictions
10.03.1997 (38)

Type : LD50
Species : mouse
Strain :
Sex :
Number of animals :
Vehicle :
Value : = 5888 mg/kg bw

Method : other: no data
Year : 1982
GLP : no data
Test substance : no data
Remark : No toxic effect noted.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
03.02.1997 (59) (105)

Type : LD50
Species : mouse
Strain :
Sex :
Number of animals :
Vehicle :
Value : = 3275 mg/kg bw
Method : other: no data
Year : 1989
GLP : no data
Test substance : no data
Remark : Russian original literature.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
03.02.1997 (105)

Type : LD50
Species : mouse
Strain :
Sex :
Number of animals :
Vehicle :
Value : = 5457 mg/kg bw
Method : other: no data
Year : 1978
GLP : no data
Test substance : no data
Remark : LD50: 5.1 ml/kg (original value)
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance : Density: 1.07 g/cm3 at 20 degree C
04.02.1997 (127)

Type : LD50
Species : guinea pig
Strain :
Sex :
Number of animals :
Vehicle :
Value : = 4680 mg/kg bw
Method : other: no data
Year : 1989
GLP : no data
Test substance : no data
Remark : Russian original literature.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
03.02.1997 (105)

5.1.2 ACUTE INHALATION TOXICITY

5.1.3 ACUTE DERMAL TOXICITY

Type	:	LD50
Species	:	rabbit
Strain	:	
Sex	:	
Number of animals	:	
Vehicle	:	
Value	:	> 3000 mg/kg bw
Method	:	other: no data
Year	:	1984
GLP	:	no data
Test substance	:	no data
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability	:	(4) not assignable Secondary literature.

03.04.1997 (57)

5.1.4 ACUTE TOXICITY, OTHER ROUTES

Type	:	LD50
Species	:	rat
Strain	:	
Sex	:	
Number of animals	:	
Vehicle	:	
Route of admin.	:	i.p.
Exposure time	:	
Value	:	= 1250 mg/kg bw
Method	:	other: no data
Year	:	1975
GLP	:	no
Test substance	:	no data
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

03.02.1997 (59) (82) (105)

Type	:	LD50
Species	:	rat
Strain	:	
Sex	:	
Number of animals	:	
Vehicle	:	
Route of admin.	:	i.p.
Exposure time	:	
Value	:	= 500 - 1000 mg/kg bw
Method	:	Limit test
Year	:	1966
GLP	:	no
Test substance	:	
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Test condition	:	Number of animals: 6; 3 male and 3 female Application: 500, 1000 and 2000 mg/kg (50 % aqueous solution) Observation: 7 days
Test substance	:	Impurities: 0.5 % diester 1.25 % water 1.0 % ethylene glycol Stabilization: 200 ppm methyl ether of hydrochinon
Reliability	:	(2) valid with restrictions
07.02.1997		(38)

Type	:	LD50
Species	:	mouse
Strain	:	
Sex	:	
Number of animals	:	
Vehicle	:	
Route of admin.	:	i.p.
Exposure time	:	
Value	:	= 528 mg/kg bw
Method	:	other: no data
Year	:	1973
GLP	:	no
Test substance	:	no data
Remark	:	LD50: 0.497 ml/kg (original value)
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance	:	Density: 1.064 g/cm3 at 25 degree C
Reliability	:	(2) valid with restrictions
04.02.1997		(58) (75)

Type	:	other: preliminary study
Species	:	mouse
Strain	:	
Sex	:	
Number of animals	:	
Vehicle	:	
Route of admin.	:	i.p.
Exposure time	:	
Method	:	according to FDA guideline: National Formulary XIV Biological Tests for Plastic Containers for Ophthalmics
Year	:	1980
GLP	:	no
Test substance	:	no data
Remark	:	Test concentrations: 30, 300, 3000 and 30000 ppm diluted in cottonseed oil Control: cottonseed oil Observation: 0, 2, 8, 24, 48 and 72 hours after injection Results: No systemic toxicity, no mortality.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
29.05.1994		(69)

Type	:	
Species	:	dog
Strain	:	
Sex	:	
Number of animals	:	
Vehicle	:	

Route of admin.	:	i.v.
Exposure time	:	
Method	:	
Year	:	1974
GLP	:	no
Test substance	:	no data
Remark	:	Number of animals: 3 (male, mongrel dogs) Doses: 105.2, 52.6, 26.3 and 13.6 mg/kg anesthetized with 35-45 mg/kg i.p. of sodium pentobarbital Result: increased respiratory rate, decreased heart rate and changes in the electrocardiogram. Blood pressure: biphasic response (an abrupt fall, followed by a more sustained rise) The highest tested concentration was lethal for the animals.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

24.03.1994 (76)

Type	:	other: Intradermal irritation test
Species	:	rat
Strain	:	
Sex	:	
Number of animals	:	
Vehicle	:	
Route of admin.	:	other: intradermal
Exposure time	:	
Method	:	irritation test
Year	:	1988
GLP	:	no
Test substance	:	
Remark	:	2-Hydroxyethyl methacrylate monomer (HEMA), diluted with saline in the range of 0-20 %, was tested for intradermal irritation in 10 male Wistar rats. Radioactive indicator (113mIn) was used for the quantitative evaluation of irritation. At low concentrations (up to 1 %) irritation caused by 2-Hydroxyethyl methacrylate was very mild. Higher levels (5 % or more) produced a significant response. The degree of irritation was dose dependent. In the concentration range 0-10 %, the response was exponential.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance	:	Purity: 96.30 % 0.29 % Ethylene glycol dimethacrylate Impurities: 3.41 % as determined by GC

29.05.1994 (129)

5.2.1 SKIN IRRITATION

Species	:	rabbit
Concentration	:	
Exposure	:	
Exposure time	:	
Number of animals	:	
PDII	:	
Result	:	slightly irritating
EC classification	:	not irritating

Method : Draize Test
Year : 1983
GLP : no data
Test substance : no data
Remark : Primary irritation score: 1.0
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
25.02.1994 (137)

Species : rabbit
Concentration :
Exposure :
Exposure time :
Number of animals :
PDII :
Result : not irritating
EC classification : not irritating
Method : Draize Test
Year : 1977
GLP : no
Test substance : as prescribed by 1.1 - 1.4
Remark : Primary irritation score: 0.08 of 8 (24 hour) non scarified skin reevaluated according to OECD 404, 6 animals, primary irritation score scarified skin: 0.37 of 8.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
Study well documented, meets generally accepted scientific principles, acceptable for assessment.
03.04.1997 (121)

Species : rabbit
Concentration :
Exposure :
Exposure time :
Number of animals :
PDII :
Result : slightly irritating
EC classification :
Method : Draize Test
Year : 1980
GLP : no data
Test substance : no data
Remark : Hydroxyethyl methacrylate was tested in various grades (5 experiments with 6 animals for each experiment)
Application: 0.25 ml, occlusive, abraded and non abraded skin
Highest primary irritation score: 1.2 (24 hours) Draize score
HEMA was found to be mildly irritating to rabbit skin.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (4) not assignable
Only summary of the toxicological study available. Without detail documentation but acceptable for assessment.
14.03.1997 (9)

Species : rabbit
Concentration :

Exposure	:	
Exposure time	:	
Number of animals	:	
PDII	:	
Result	:	corrosive
EC classification	:	
Method	:	other: DOT Skin Corrosion, Department of Transportation CFR Title 49, 173, 1200
Year	:	1980
GLP	:	no data
Test substance	:	
Remark	:	Number of animals: 6 Application: 0.1 ml, undiluted, 4 h (intact skin) pH: 3 Oberservation: 4 and 48 hours
Result	:	HEMA was not found to be corrosive after 4 hours of exposure. After 48 hours the substance was found to be corrosive in 2 of 6 animals (pH = 3).
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance	:	Purity: 2-Hydroxyethyl methacrylate: > 90 % Methacrylic acid: < 5 % Water: 1 %
Reliability	:	(3) invalid Evaluation unclear, impure test material.

14.03.1997 (91)

Species	:	rabbit
Concentration	:	
Exposure	:	
Exposure time	:	
Number of animals	:	
PDII	:	
Result	:	slightly irritating
EC classification	:	
Method	:	other: Range-Finding
Year	:	1980
GLP	:	no data
Test substance	:	
Remark	:	Number of animals: 3 male Application: 0.5 ml, occlusive, abraded and non abraded skin Primary irritation score: 1.3 (24 hours) Draize score (abraded skin) HEMA was found to be slightly irritating to rabbit skin.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance	:	Purity: 2-Hydroxyethyl methacrylate: 88 % Ethyleneglycol dimethacrylate: 1.5 % Methacrylic acid: 2 - 5 % low boilers: 1.3 % high boilers: 7.0 %
Reliability	:	(2) valid with restrictions Impure test material.

14.03.1997 (101)

Species	:	rat
Concentration	:	
Exposure	:	

Exposure time	:	
Number of animals	:	
PDII	:	
Result	:	not irritating
EC classification	:	not irritating
Method	:	
Year	:	1966
GLP	:	no
Test substance	:	
Remark	:	One rat to which the undiluted material was applied showed slight desquamation but none of the others showed any abnormality.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test condition	:	Number of animals: 3 female Application: six alternate 24-hour periods, occlusive, undiluted or as 50 % aqueous solution in acetone Observation: 7 days
Test substance	:	Impurities: 0.5 % diester 1.25 % water 1.0 % ethylene glycol Stabilization: 200 ppm methyl ether of hydrochinon
Reliability	:	(4) not assignable Documentation insufficient for assessment.

03.04.1997 (38)

5.2.2 EYE IRRITATION

Species	:	rabbit
Concentration	:	
Dose	:	
Exposure Time	:	
Comment	:	
Number of animals	:	
Result	:	moderately irritating
EC classification	:	irritating
Method	:	Draize Test
Year	:	1978
GLP	:	no
Test substance	:	as prescribed by 1.1 - 1.4
Remark	:	Primary irritation score: 4.6 of 13 reevaluated according to OECD 405. Application: undiluted. Number of animals: 6. Conjunctivae redness: all animals after 24 hours, persisting for 2-5 days. Slight corneal opaqueness, reversible at day 6.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability	:	(2) valid with restrictions

18.02.1997 (122)

Species	:	rabbit
Concentration	:	
Dose	:	
Exposure Time	:	
Comment	:	
Number of animals	:	
Result	:	highly irritating

EC classification	:	irritating
Method	:	
Year	:	1980
GLP	:	no data
Test substance	:	no data
Remark	:	Application: 0.1 ml Number of animals: 3 The adverse effects on the conjunctivae and the cornea were long lasting. Fluorescein staining revealed large areas of cornea ulceration. There was, in addition, a definite increase in corneal thickness in all test animals, an effect which persisted for at least 7 days. After 15 days the rabbit eyes were almost back to normal although a minor corneal defect persisted in one animal. The studies did not include observations on the effect of washing the eyes following instillation of the test material although bearing in mind the solubility of HEMA it is likely that washing with water would significantly reduce the extent of damage. HEMA was found to be a severe irritating to the rabbit eye.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability	:	(2) valid with restrictions Only summary of the toxicological study available. Without detail documentation but acceptable for assessment.

27.01.1997 (9)

Species	:	rabbit
Concentration	:	
Dose	:	
Exposure Time	:	
Comment	:	
Number of animals	:	
Result	:	irritating
EC classification	:	irritating
Method	:	
Year	:	1966
GLP	:	no
Test substance	:	
Remark	:	The material caused conjunctivitis, iritis and keratitis with corneal cloeding within one hour of instillation. This condition persited for 48 hours and than gradually resolved over the next four days. After 7 days the eyes of two animals appeared normal, but one animal had a persitent small corneal ulcer. The instillation was repeated in a further three rabbits and the eyes washed with saline after five seconds contact. In these animals the early signs were much severe and the eyes appeared normal by the 4th day.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test condition	:	Number of animals: 3 Application: one drop, undiluted (no wash out of the test substance) Observation: 7 days
Test substance	:	Impurities: 0.5 % diester 1.25 % water 1.0 % ethylene glycol Stabilization: 200 ppm methyl ether of hydrochinon
Reliability	:	(4) not assignable

Documentation insufficient for assessment.
03.04.1997 (38)

Species	:	rabbit
Concentration	:	
Dose	:	
Exposure Time	:	
Comment	:	
Number of animals	:	
Result	:	corrosive
EC classification	:	
Method	:	other: Range-Finding
Year	:	1980
GLP	:	no data
Test substance	:	
Remark	:	Number of animals: 3 male Application: 0.1 ml, occlusive
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance	:	Purity: 2-Hydroxyethyl methacrylate: 88 % Ethyleneglycol dimethacrylate: 1.5 % Methacrylic acid: 2 - 5 % low boilers: 1.3 % high boilers: 7.0 %
Reliability	:	(2) valid with restrictions Impure test material.

14.03.1997 (101)

5.3 SENSITIZATION

Type	:	Buehler Test
Species	:	guinea pig
Number of animals	:	
Vehicle	:	
Result	:	not sensitizing
Classification	:	not sensitizing
Method	:	other: modified Buehler-Test
Year	:	1982
GLP	:	no
Test substance	:	as prescribed by 1.1 - 1.4
Remark	:	Induction; dermal, 6 hours, 3 exposures during 2 weeks, occlusive 0.5 ml undiluted (maximum non irritating concentration) Challenge: After 2 weeks; single dermal application of 0.5 ml for 6 hours (occlusive). Number of animals: 20, control group: 10 0 of 20 animals reacted positively.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

18.02.1997 (112)

Type	:	Freund's complete adjuvant test
Species	:	guinea pig
Number of animals	:	
Vehicle	:	
Result	:	sensitizing
Classification	:	sensitizing
Method	:	other: no data

Year : 1982
GLP : no
Test substance :
Remark : 4 of 8 animals reacted positively on day 21, but all animals did not show any skin reaction on day 35.
Guinea pigs sensitized to 2-hydroxyethylmethacrylate lost their reactivity in the course of the investigation.
Solvent: oleum arachidis/Methylethylketone (aramek), 3 M.
Maximum non irritant concentration was not determined.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance : Purity: > 99 %
Reliability : (2) valid with restrictions
06.02.1997 (135) (136)

Type : Guinea pig maximization test
Species : guinea pig
Number of animals :
Vehicle :
Result : sensitizing
Classification : sensitizing
Method : OECD Guide-line 406 "Skin Sensitization"
Year : 1984
GLP : no
Test substance : no data
Remark : Induction:
Day 0: in presence of Freud's Complete adjuvant (FCA), concentration of 25 % (50 ul) in sterile water i.d.
Day 7, 8: 2-Hydroxyethyl methacrylate was administered (concentration: 100 %, 400 ul) by cutanous route
Challenge:
Day 21: 25 % (25 ul) in petrolatum on the flank, occlusive patch for 24 hours
Evaluation: 48 and 72 hours after patch removing
Result: 7 of 15 animals were sensitizied.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
20.05.1994 (13)

Type : Guinea pig maximization test
Species : guinea pig
Number of animals :
Vehicle :
Result : sensitizing
Classification : sensitizing
Method : other: according to Magnusson and - Kligman, 1969
Year : 1980
GLP : no data
Test substance : no data
Remark : Testsubstance: three different grades of HEMA
Challenge: Two weeks after topical induction with 10 and 25 % HEMA
Re-challenge: One week after the first challenge with 5 % HEMA
Evaluation: 48 and 78 hours following application of the challenge and re-challenge patches
Animals induced with HEMA were demonstrated to be sensitized; all reacted positively to the challenge with a 10 % solution. Following the challenge with 5 % HEMA, HEMA I

and HEMA II, four of the sensitized animals responded to all three and a further two animals only to HEMA I and HEMA II. The results indicate that HEMA is a potent sensitizer, a property which appears to be independent of the residual methacrylic acid levels.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (2) valid with restrictions
Only summary of the toxicological study available. Without detail documentation but acceptable for assessment.

10.03.1997 (9)

Type : Guinea pig maximization test
Species : guinea pig
Number of animals :
Vehicle :
Result : sensitizing
Classification : sensitizing
Method : other: according to Magnusson and Kligman
Year : 1985
GLP : no data
Test substance : no data
Remark : Induction: Day 0: 3 pairs of injections; 1. 2 x 50 uL suspension of FCA in sterile water (1:1), 2. 2 x 50 uL test substance 1-25 % in different vehicles, 3. 2 x 50 uL test substance in FCA (1:1)
Day 7: approx. 250 mg 10 % sodium dodecyl sulphate in petrolatum, 24 h, uncovered
Day 8: 400 uL test substance undiluted, occlusive, 48 h
Challenge: Day 21: 25 uL test preparation, 25 - 100 % in different vehicles 24 h
Guinea pigs exhibited none or slight responses to sensitization with low concentration of 2-Hydroxyethyl methacrylate in the guinea pig maximization test, while 60 - 100 % reacted to high concentrations regardless of the vehicle used in induction. The major determinant of the frequency of response was the concentration used for intradermal induction. Positive responses ranged from 0/20 to 9/12
animals.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (2) valid with restrictions
Documentation sufficient for assessment.

27.01.1997 (14)

Type : Guinea pig maximization test
Species : guinea pig
Number of animals :
Vehicle :
Result : sensitizing
Classification : sensitizing
Method : other: according to Magnusson and Kligman (1969)
Year : 1995
GLP : no data
Test substance : no data
Remark : The possibility of delayed hypersensitivity reaction or

contact dermatitis occuring in the guinea-pig in response to methacrylate used as experimental dentine primers.
None of the BALB/C mice used in the delayed hypersensitivity test using 2-HEMA produced an allergic reaction.

Result : Six of 10 (mean response, 2.4) guinea-pigs sensitized with 2-HEMA showed a positive reaction at 24 h, and five (mean response, 2.2) showed a positive reaction at 48 h. The maximum mean response possible was 7.0.
Cross-reactions in MMA or Methacrylic acid sensitized guinea-pigs at 24 and 48 h were not seen in HEMA challenged guinea-pigs.
The results of the maximization test were evaluated according to Sato et al.; Skin Research 7: 225 - 237 (1991)

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Test condition : Number of animals: 10 per dose group
Negative control: methacrylic acid solution
Induction: Day 0: 3 pairs of injections; 1. 2 x 50 ul an aqueous mixture of Freud's complete adjuvant (FCA), 2. 2 x 50 ul experimental dentine primer alone, 3. 2 x 50 ul experimental dentine primer and FCA, i.d.
Day 6: 10 % sodium lauryl sulphate (SLS) in pet. was applied 24 h before the patch
Day 7: topical sensitization, 0.2 ml experimental dentin primer, undiluted (100 %), filter-paper patch backed by impermeable plastic tape for 48 h
Challenge: Day 21: 100 ul test substance (100 %) on filter-paper under a sealed dressing as for induction for 24 h
Evaluation: 24 and 48 hours after patch removing
For sensitization, the experimental dentine primer was deluted with olive oil and acetone (7:3 (v/v)). As antigen 2-HEMA were diluted at concentrations of 0.2, 1 and 5 % by weight.

Reliability : (2) valid with restrictions
Study well documented, test procedure in accordance with national standard methods, meets generally accepted scientific principles, acceptable for assessment.

14.02.1997 (53)

Type : Guinea pig maximization test
Species : guinea pig
Number of animals :
Vehicle :
Result :
Classification :
Method : other: cross reactivity, Magnusson Kligman
Year : 1984
GLP : no
Test substance :
Remark : 1 animal out of 10 reacted to 2-HPMA. The same animal also reacted with HEMA with the same mean response as for HPMA. The data may suggest possible cross-reactivity or concomitant reactivity to HEMA.
Induction: i.d., 5 % (w/w) 2-Hydroxypropyl methacrylate (HPMA) in olive oil/acetone (10:1). Topical: 25 % (w/w)

HPMA.
Challenge: 2 % (w/w) HEMA in petrolatum, 2 % (w/w) HPMA in petrolatum.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Test substance : Purity: > 95 %.

29.05.1994 (7)

Type : Patch-Test
Species : human
Number of animals :
Vehicle :
Result : ambiguous
Classification :
Method : other: A1-test applied to the upper portion of the back; 48 hours, case report
Year : 1985
GLP : no data
Test substance : no data
Remark : A case of hand contact dermatitis from anaerobic sealants was reported. The patient had positive results on patch tests with different sealants; Polyethylene glycol di-methacrylate; diethylene glycol dimethacrylate; ethylene glycol dimethacrylate; hydroxypropyl methacrylate; hydroxyethyl methacrylate (test concentration: 5%, 1%, and 0.1% in petrolatum); and tetrahydrofurfuryl meth-acrylate monomer.
All but the tetrahydrofurfuryl methacrylate were identified as being present in the Loctite compounds to which the patient was allergic.
11 unexposed control subjects had negative patch tests to the sealants 1% in olive oil. Cross reactivities are likely.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

10.03.1997 (88)

Type : Patch-Test
Species : human
Number of animals :
Vehicle :
Result : ambiguous
Classification :
Method : other: A1-test patches, 48 hours, case reports
Year : 1983
GLP : no
Test substance : no data
Remark : 3 printers with contact dermatitis from working with photoprepolymers showed positive patch test reactions with 2-hydroxyethyl methacrylate 1 % in petrolatum (erythema and infiltration, sometimes papules and vesicles). The patches were read only once.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

03.05.1994 (83)

Type : Patch-Test
Species : human
Number of animals :
Vehicle :

Result	:	ambiguous
Classification	:	
Method	:	other: Finn Chambers, 24 hours occlusive, case reports
Year	:	1988
GLP	:	no data
Test substance	:	no data
Remark	:	Two cases of positive patch-test reactions with 2-hydroxy-ethylmethacrylate are reported, a dentist and a patient occupationally exposed to acrylate sealants. Both persons showed positive reactions with a number of other acrylates and methacrylates which were supposed to be the causative agents.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

24.05.1994 (49)

Type	:	Patch-Test
Species	:	human
Number of animals	:	
Vehicle	:	
Result	:	ambiguous
Classification	:	
Method	:	other: Grupo Espanol de Investigacion Dermatitis de Contacto (GEIDC) methodology, case reports
Year	:	1988
GLP	:	no
Test substance	:	no data
Remark	:	6 workers with contact dermatitis to aerobic sealants were patch tested with 2 % hydroxyethyl methacrylate in petrolatum and other acrylates and methacrylates. All 6 workers showed positive reactions 96 hours after removal of the patches. All patients showed also positive reactions with at least one but often more other acrylates or methacrylates. Therefore the observed reactions may well have been due to cross reactivity.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

20.05.1994 (15) (16)

Type	:	Patch-Test
Species	:	human
Number of animals	:	
Vehicle	:	
Result	:	ambiguous
Classification	:	
Method	:	other: case report
Year	:	1983
GLP	:	no data
Test substance	:	no data
Remark	:	A case of a printer with multiple allergies to work place and other substances is reported. He developed a contact dermatitis to photoprepolymer containing printing plates. A positive pach test reaction to 2-hydroxyethylmethacrylate (1 % in petrolatum) was reported. No further details given.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

10.03.1997 (141)

Type : Patch-Test
Species : human
Number of animals :
Vehicle :
Result : ambiguous
Classification :
Method : other: dermatological test series, case report
Year : 1990
GLP : no data
Test substance : no data
Remark : A case of a patient with contact dermatitis following the use of a limb prothesis is described. Amongst other acrylates and methacrylates a patch test was positive with 2-Hydroxyethyl methacrylate 2 % in petrolatum. Cross reactivity with acrylates is likely. It is not clear from the publication if HEMA was a constituent of the prothesis.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
29.05.1994 (103)

Type : Patch-Test
Species : human
Number of animals :
Vehicle :
Result : ambiguous
Classification :
Method : other: dermatological test series, case report
Year : 1989
GLP : no data
Test substance : no data
Remark : A case of a patient with contact dermatitis following the use of a limb prothesis is described. Amongst other acrylates and methacrylates a patch test was positive with 2-Hydroxyethyl methacrylate 2 % in petrolatum. Cross reactivity with acrylates is likely. It is not clear from the publication if HEMA was a constituent of the prothesis.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (4) not assignable
11.03.1997 (102) (104)

Type : Patch-Test
Species : human
Number of animals :
Vehicle :
Result : not sensitizing
Classification : not sensitizing
Method : other: human patch test
Year : 1993
GLP : no
Test substance : other TS
Remark : Of 82 patients with a suspected acrylate allergy patch tested inter alia with hydroxyethyl methacrylate 5 % in petrolatum none reacted positively to this test substance.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance : Test series, acrylates, S.p.A. No further data on purity, stabiliser content etc.

21.03.1994 (35)

Type	:	Patch-Test
Species	:	human
Number of animals	:	
Vehicle	:	
Result	:	ambiguous
Classification	:	
Method	:	other: no data, case report
Year	:	1979
GLP	:	no
Test substance	:	no data
Remark	:	A laboratory technician handling a 80% solution of HEMA in ethanol developed allergic contact dermatitis to hydroxyethyl methacrylate associated with nausea, diarrhoea and persistent paresthesiae of the fingertips. The gastrointestinal symptoms were reproduced by patch testing. Cross reactions occured to methy-, ethyl-, propyl- and isopropyl methacrylate but not to butyl- or isobutyl meth-acrylate. Patch tests to 5 % hydroxyethyl methacrylate in absolute alcohol in seventeen consecutive controls were negative.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

31.05.1994 (73)

Type	:	Patch-Test
Species	:	human
Number of animals	:	
Vehicle	:	
Result	:	ambiguous
Classification	:	
Method	:	other: no data, case report
Year	:	1985
GLP	:	no
Test substance	:	
Remark	:	A 39-year old man had worked as a maintenance fitter and developed contact dermatitis to Hydroxypropyl acrylate. The man was patch tested with 2-Hydroxyethyl methacrylate (2 % in petrolatum) and showed postive reactions. Patch tests to 6 control subjects were negative. Cross reactivity or reaction to impurities is probable.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance	:	Purity: approx. 90 %

03.05.1994 (61)

Type	:	Patch-Test
Species	:	human
Number of animals	:	
Vehicle	:	
Result	:	not sensitizing
Classification	:	
Method	:	other: no data, case report
Year	:	1986
GLP	:	no
Test substance	:	no data
Remark	:	A 2-year-old girl developed dermatitis to a polyester resin prosthesis. She was patch tested with 2-Hydroxyethyl

methacrylate (2 % in petrolatum). The patch test result was negative. Control tests on 20 normal volunteers gave no positive reactions.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

24.05.1994 (63)

Type : Patch-Test
Species : human
Number of animals :
Vehicle :
Result : ambiguous
Classification :
Method : other: no data, case report
Year : 1979
GLP : no
Test substance : no data
Remark : A laboratory technician handling a 80% solution of HEMA in ethanol developed allergic contact dermatitis to hydroxyethyl methacrylate associated with nausea, diarrhoea and persistent paresthesiae of the fingertips. The gastrointestinal symptoms were reproduced by patch testing. Cross reactions occured to methy-, ethyl-, propyl- and isopropyl methacrylate but not to butyl- or isobutyl meth-acrylate.
Patch tests to 5 % hydroxyethyl methacrylate in absolute alcohol in seventeen consecutive controls were negative.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
Documentation sufficient for assessment.

27.01.1997 (73)

Type : Patch-Test
Species : human
Number of animals :
Vehicle :
Result : sensitizing
Classification :
Method : other: no data, case reports
Year : 1989
GLP : no data
Test substance : no data
Remark : 2 patients with hand dermatitis due to percision ball bearings were patch tested with 0.1 % 2-hydroxyethyl methacrylate in petrolatum. Both patients showed a positive reaction.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

03.05.1994 (37)

Type : Patch-Test
Species : human
Number of animals :
Vehicle :
Result : sensitizing
Classification :
Method : other: no data, case reports
Year : 1979

GLP : no
Test substance : no data
Remark : 5 patients developed an allergic contact dermatitis when working in a photoprepolymer printing plate making procedure. Four of them were patch tested and showed positive reaction to 2-Hydroxyethyl methacrylate (Test-concentration: 0.1 % in alcohol), one of the ingredients in the photoprepolymer mixture.
11 eczematous patients not exposed to such substances showed negative patch test results to 0.1 % 2-HEMA in alcohol.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
Documentation sufficient for assessment.
27.01.1997 (7) (67)

Type : Patch-Test
Species : human
Number of animals :
Vehicle :
Result : ambiguous
Classification :
Method : other: not specified, case reports
Year : 1992
GLP : no
Test substance : other TS
Remark : Dental personnel (8 persons) were sensitized to components of a dental adhesive system based on maleic acid and 2-hydroxyethyl methacrylate. It contains 40-50 % 2-hydroxy-ethyl methacrylate and 50-60 % BIS-GMA. All patients showed a positive patch test reaction to components of the preparation (1 % w/w in petrolatum). All patients also had a positive patch test reaction to 2-Hydroxyethyl meth-acrylate but none to BIS-GMA or any other epoxy acrylate in the (meth)acrylate series (Chemotechnique). 4 out of 8 of the allergic patients complained of paresthesia which has been reversible. 6 of the cases have already been described by Kanerva et al. 1991.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance : (meth)acrylate test series, Chemotechnique
03.05.1994 (45)

Type : Patch-Test
Species : human
Number of animals :
Vehicle :
Result :
Classification : not sensitizing
Method : other: occlusion, 24 hours, Finn chamber
Year : 1990
GLP : no data
Test substance :
Remark : Of 3376 patients observed between 1974 and 1983, suspected of having an occupational contact dermatitis 14 were diagnosted as having allergic eczema caused by various acrylates. 5 patients showed positive patch test reactions with 2-Hydroxyethyl methacrylate (2 % in petrolatum). These patients also showed positive patch test reactions with

other acrylates and methacrylates. Cross sensitization is likely.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (2) valid with restrictions

11.02.1997 (26)

Type : Patch-Test
Species : human
Number of animals :
Vehicle :
Result : ambiguous
Classification :
Method : other: occlusiv, 24 hours, using Finn Chambers, case reports
Year : 1989
GLP : no
Test substance :
Remark : 7 patients with allergic contact dermatitis due to dental composite resin products (DCR) were patch tested with 2-Hydroxyethyl methacrylate. 3 out of 5 patients showed a positive reaction. All 3 patients showed stronger reactions to other acrylates and methacrylates. Therefore the observed patch test reactions may well have been due to cross reactivity in persons sensitized to acrylates. Testconcentration: 2 % 2-Hydroxyethyl methacrylate in petrolatum

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Test substance : Purity: 95 % (w/w)

03.05.1994 (48)

Type : Patch-Test
Species : human
Number of animals :
Vehicle :
Result : sensitizing
Classification :
Method : other: occlusive patch-test 48 hours, prick Test, case reports
Year : 1991
GLP : no data
Test substance :
Remark : Dental personnel (6 persons) developed an allergic contact dermatitis from a dentin adhesion promotor system containing 2-Hydroxyethyl methacrylate and an epoxyacrylate, (BIS-GMA). All 6 patients developed positive patch test reactions with 2-hydroxyethyl methacrylate (2 % in petrolatum). Positive reactions to other acrylates and methacrylates were also observed. Cross sensitization is possible. 3 patients complained of paresthesia of the finger tips.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Test substance : other dental series, Chemotechnique

Reliability : (2) valid with restrictions
Documentation sufficient for assessment.

27.01.1997 (51)

Type : Patch-Test
Species : human
Number of animals :

Vehicle	:	
Result	:	sensitizing
Classification	:	
Method	:	other: occlusive, 24 hours, using Finn Chambers, case report
Year	:	1993
GLP	:	no data
Test substance	:	no data
Remark	:	1 out of 4 patients with occupational allergic contact dermatitis caused by working with dental prostheses was patch tested with 2-Hydroxyethylmethacrylate (2 % (w/w) in petrolatum) and showed a positive reaction. All patients had positive allergic patch test reactions to methyl methacrylate.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

24.05.1994 (46)

Type	:	Patch-Test
Species	:	human
Number of animals	:	
Vehicle	:	
Result	:	ambiguous
Classification	:	
Method	:	other: using Finn Chamber, case report
Year	:	1986
GLP	:	no
Test substance	:	no data
Remark	:	A 30-year-old female laboratory technician developed work-related systemic symptoms of fatique, headache, nausea, vomiting, numbness of the tongue, and irregular menstruation. Patch tests performed with 2-Hydroxyethyl methacrylate 5 % in petrolatum showed no signs of allergic hypersensivity but the patient developed the same systemic symptoms as experienced during work exposure. The patch tests were removed after 18 hours and the systemic symptoms dissapeared gradually over a few days.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

31.05.1994 (3)

Type	:	Patch-Test
Species	:	human
Number of animals	:	
Vehicle	:	
Result	:	not sensitizing
Classification	:	
Method	:	other: using Finn Chambers, case reports
Year	:	1986
GLP	:	no
Test substance	:	
Remark	:	Two laboratory technicians, exposed to monomers used during manufacture of soft, disposible contact lenses, developed an occupational hand dermatitis. Patch-tests with the constituent 2-hydroxyethyl methacrylate in concentrations of 0.1, 1 and 5 % showed a weak reaction in case 1 and no reaction in case 2. Cross reactivity is possible.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance	:	Purity: 98 %

Reliability : (2) valid with restrictions
Documentation sufficient for assessment.
27.01.1997 (85)

Type : Patch-Test
Species : human
Number of animals :
Vehicle :
Result : ambiguous
Classification :
Method : other: with the European standard series (Chemotechnique Diagnostics AB (methacrylate series)), case report
Year : 1991
GLP : no data
Test substance : no data
Remark : A 35-year-old nurse developed contact dermatitis due to an electrically-conductive adhesive gel containing methacrylates. She showed positive patch-test reactions to 2-hydroxyethyl methacrylate (2% in petrolatum), 2-hydroxypropyl methacrylate (2% in pertolatum), and ethylene glycol dimethacrylate (2% in pertrolatum). Cross reactivities are possible.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
03.05.1994 (71)

Type : Split adjuvant test
Species : guinea pig
Number of animals :
Vehicle :
Result : not sensitizing
Classification : not sensitizing
Method : other: no data
Year : 1981
GLP : no
Test substance : no data
Remark : Induction: 0.1 ml test material, 4 x in 10 days, topical, at the time of the third application 0.2 ml of Freud's adjuvant was injected intradermally
After 2 weeks of rest period:
Challenge: with maximum non irritant concentration (not specified)
Result: 0 out of 10 animals were sensitizied.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
15.04.1994 (89)

Type : other: adjuvant test with haptenized macrophages
Species : guinea pig
Number of animals :
Vehicle :
Result : not sensitizing
Classification :
Method : other
Year : 1984
GLP : no data
Test substance : no data
Remark : Preincubation of oil induced peritoneal exsudate cells (PEC) with 38 mM concentration of test substance at 37 deg. C for

30 minutes.
Induction: 3 x 10 exp7 haptenized macrophages into different application sites.
Challenge: 12 or 14 days after last induction, open epicutaneous application of 26 mg substance in Aramek.
Result: 0 of 6 animals reacted positively.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
21.03.1994 (138)

Type :
Species : guinea pig
Number of animals :
Vehicle :
Result : not sensitizing
Classification : not sensitizing
Method : other: Polak method
Year : 1983
GLP : no
Test substance : no data
Remark : Induction: Day 0: 4 footpad injections of 0.1 ml of an emulsion containing 2 mg/ml 2-Hydroxyethyl methacrylate, in ethanol:saline (1:4), in Freud's complete adjuvant (FCA-Difco mycobacterium butyricum). In addition, 0.1 ml of the emulsion was injected into the nape of the neck. Each animal received a total of 1 mg of the substance.
Challenge: Day 7: open skin testing, 0.02 ml of a solution of the substance in acetone:olive oil (4:1) onto the shaved flank. Tested concentrations: dilutions of 5 % or the maximum concentration which gave no non-specific irritation.
Skin tests were repeated weekly at different sites on the flank for up to 12 weeks. 0/6 animals reacted positively.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
31.05.1994 (81)

5.4 REPEATED DOSE TOXICITY

Species : rat
Sex : male/female
Strain : Crj: CD(SD)
Route of admin. : gavage
Exposure period : Males, 49 days
Females, from 14 days before mating to day 3 of lactation
Frequency of treatment : Once daily
Post obs. period : 1 day
Doses : 0 (vehicle),30,100,300,1000 mg/kg/day
Vehicle: water for injection
Control group : yes, concurrent vehicle
NOAEL : = 30 mg/kg bw
LOAEL : = 100 mg/kg bw
Method : OECD combined study TG422

Year : 1997
GLP : yes
Test substance : other TS: Nippon shokubai, Purity 97.6%
Result : The NOAELs for repeat dose toxicity are considered to be 30 mg/kg/day for males and females.
Detail:[Males]

1) General condition: No death or no moribund were found in 30, 100 and 300 mg/kg/day groups. At 1000 mg/kg/day, one death on day 20 of dosing was seen and abnormality wasn't seen except for salivation until the previous day. With the animal that survived, no abnormality was found in general condition for 30, 100 and 300 mg/kg/day groups. At 1000 mg/kg/day, salivation was seen in about 1 to 30-minutes after dosing from day 3.
2) Body weight: No significant difference from control group was seen in 30, 100 or 300 mg/kg/day groups. At 1000 mg/kg/day, the significantly low value was recorded during day 18 to day 25 of dosing and during day 32 to day 50 of dosing.
3) Food consumption: At 30 and 300 mg/kg/day, no significant difference from control was seen. At 100 mg/kg/day, the significant high values were seen on day 31. But no dose-related changes were observed.
At 1000 mg/kg/day, the statistically significant low values were recorded on day 13, 31 and during day 38 to day 45.
4) Hematological examination: No significant difference from control group was seen for all groups up to 1000 mg/kg/day dose.
5) Blood chemical examination: At 30 and 300 mg/kg/day, the statistically significant high value in BUN was seen. As the difference was very small, this was not considered as the adverse effect of HEMA dosing. At 100 mg/kg/day, a high mean value of BUN was recorded but was not statistically significant different from control. At 1000 mg/kg/day, the significant high values were recorded in BUN, K, Cl, I-phosphorous and Triglyceride.
6) Autopsy: No abnormality was found in 30 or 100 mg/kg groups. In the 300 mg/kg group, the white spot in the unilateral kidney of animal and the bilateral atrophy and softening of the testicle were observed in 1 animal. In the 1000 mg/kg group, the dark-red of the thymus gland in 1 animal and the hypertrophy of the bilateral kidney of in 1 animal were observed.
7) Weight of organs: At 30 mg/kg/day, no significant difference from control group was seen in absolute or relative weight for all organs. At 100 and 300 mg/kg/day, the significant high value was recorded in the absolute weight of kidneys. At 1000 mg/kg/day, the statistically significant high values were recorded in the relative weight of liver and kidneys.
8) Histopathological examination: At 1000 mg/kg/day in the

survived animals, the dilatation of renal tubule in 3 animals in the kidney and the dilatation of collecting tubules in 2 animals were observed. But, all these changes were just slight. And the dilatation of renal tubule has a significant difference but no dose-related changes. As for the dilatation of collecting tubules, it has no significant difference but increasing tendency. In the other groups, there were hemorrhage of thymus gland, microgranuloma of the heart, microgranuloma of the liver and hepatocyte vacuolar degeneration of the centrilobular, renal basophilic tubules, eosinophilic corpuscle in proximal tubule, cyst, diffusive mineral deposition and neutrophile infiltration. But it was judged to be the incidental change, because they were whether it equally observed even in the control group or considered sporadic change. And no abnormality was observed in spleen, adrenal, testiculus and brain in the control and 1000 mg/kg group.

In the succumbed animal of the 1000 mg/kg group, there were hemorrhage of the thymus gland, edema of the lung, autolysis of adrenal and lung and thymus gland with the dead animal of 1000 mg/kg group. As for those degrees, all were just slight. In the adrenal with abnormality in the autopsy, no change that suggested hypertrophy was seen.

[Females]

1) General condition: (lethality) No death or no moribund were found in 30, 100 and 300 mg/kg/day groups. At 1000 mg/kg/day, three death on day 6 of dosing, one death on day 12 of dosing and one death on day 17 of dosing were seen. Salivation, decrease in locomotor activity, adoption of a prone position, lacrimation, soiled fur, hypothermia, bradypnea and emaciation were seen prior to the death.
(behavior) No abnormality was found in 30, 100 and 300 mg/kg/day groups. At 1000 mg/kg/day, salivation was seen in majority about 1 to 30-minutes after dosing from day 3. One showed similar symptom as that of the succumbed, but survived.
2) Body weight: Before mating period, no significant difference from control group was seen at 30, 100 and 300 mg/kg/day. At 1000 mg/kg/day, the significant lower values were recorded on day 4 and 5 of dosing. During gestation period, no significant difference from control groups was seen in 30, 300 and 1000 mg/kg/day groups. At 100 mg/kg/day, the significant high values were recorded on day 21 of gestation, but no dose-related changes were observed.
During lactation period, no significant difference from control groups was seen in 300 and 1000 mg/kg/day groups. At 30 and 100 mg/kg/day, the significant high values were recorded on day 4 of lactation, but no dose-related changes were observed.
3) Food consumption: Before mating period, no significant difference from control group was seen at 30, 100 and 300 mg/kg/day. At 1000 mg/kg/day, low values with significant difference from control group was recorded on day 3, 6 and 13 of dosing. During gestation period, no significant difference from control groups was seen in 30 and 300 mg/kg/day groups. At 100 and 1000 mg/kg/day, the significantly high value was recorded on day 16 of gestation, but no dose-related changes were observed. During lactation period, no significant difference from

control groups was seen.
4) Weight of organs: At 30mg/kg/day, no significant difference from control group was seen for all organs in absolute or relative weight.
At 100 mg/kg/day, the significant high value was recorded in the absolute weight of kidneys. At 300mg/kg/day, mean value was higher than control, but statistical difference didn't stand. At 1000 mg/kg/day, the significantly high values were recorded in the relative and absolute weight of the kidneys.
5) Histopathological examination: In survived animals, neutrophil infiltration (unilateral) to medulla and papilla mammae part in the kidney were observed in 1 animal at 1000 mg/kg/day group, but the degree was slight. Diffused softening of the medulla oblongata in the brain was observed in 1 incidence at 1000 mg/kg group, the degree was slight. Changes observed in the 6 dead animals of the 1000 mg/kg group were the edema in the lung (1/6: incidence/sample), the atrophy in the thymus gland (1/6), the atrophy (5/6) and a Malpighian body (1/6) in the spleen, the hyperplasia of zona fasciculata (3/6) and the autolysis in the adrenal (1/6) and the erosion in the small intestinal mucosa (1/6). The degrees of change in the thymus gland and the atrophy of a Malpighian body were moderate, but the others were slight. All the changes are noted related agonism. With regard to the changes found in gross observation such as the hypertrophy of the adrenal in 2 animals, dark-red of the glandular stomach mucosa in 2 animals and dark-red of the intestine, no changes were observed as abnormal in the histopathology of the 1000 mg/kg group..
.

Test condition : Number of animals/group: Males,12; Females,12
Terminal kill: Male, day 50; Female, day 5 of lactation
Reliability : (1) valid without restriction
Well conducted study, carried out by Nippon Bioresearch Inc. Hashima Laboratory (Japan).
Flag : Critical study for SIDS endpoint
22.08.2001 (74)

Species : rat
Sex : male/female
Strain : no data
Route of admin. : inhalation
Exposure period : 3 weeks
Frequency of treatment : 6 h/d; 5 d/w
Post obs. period :
Doses : saturated atmosphere (0.5 mg/l; 90 ppm)
Control group : no
Method : other: no data
Year : 1970
GLP : no
Test substance : no data
Remark : Animal number: 4 males, 4 females
Result : erratic weight gain (F); autopsy: organs normal
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
20.05.1994 (29)

Species : rat
Sex : male/female
Strain : no data
Route of admin. : inhalation
Exposure period : 3 weeks

Frequency of treatment	:	6 h/d; 5 d/w
Post obs. period	:	
Doses	:	saturated atmosphere (0.5 mg/l; 90 ppm)
Control group	:	no
Method	:	other: no data
Year	:	1970
GLP	:	no
Test substance	:	
Remark	:	Animal number: 4 males, 4 females
Result	:	The growth of the rats was normal. A post-exposure haematological examination showed no abnormalities apart from minor interference in clotting function. The organs appeared normal and microscopy revealed no pathological change.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance	:	Analysis of the atmospheric concentration by gas chromatography it was shown that the sample contained a volatile impurity which was probably disengaged during the first day's exposure.
Reliability	:	(2) valid with restrictions

10.03.1997 (29) (38)

Species	:	rat
Sex	:	female
Strain	:	
Route of admin.	:	dermal
Exposure period	:	daily
Frequency of treatment	:	47 applications
Post obs. period	:	7 days
Doses	:	
Control group	:	no data specified
Method	:	other: no data
Year	:	1966
GLP	:	no
Test substance	:	
Result	:	At no time there was any clinical evidence of cerebellar damage.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test condition	:	Number of animals: 10 Application: shorn back
Test substance	:	Impurities: 0.5 % diester 1.25 % water 1.0 % ethylene glycol Stabilization: 200 ppm methyl ether of hydroquinone
Reliability	:	(2) valid with restrictions

10.03.1997 (38)

Species	:	rat
Sex	:	male/female
Strain	:	
Route of admin.	:	oral unspecified
Exposure period	:	daily
Frequency of treatment	:	consecutive 21 applications
Post obs. period	:	7 days

Doses	:	2000 mg/kg
Control group	:	no data specified
Method	:	other: no data specified
Year	:	1966
GLP	:	no
Test substance	:	
Remark	:	One female was killed in extremis after the 13th dose. In addition to brain lesion, this animal also showed fatty liver change. The remaining animals of both sexes showed to general non-specific ill-effects such as exess salivation, piloerection and flaccidity, a degree of incoordination which first appeared at the end of the second week of treatment and persisted until dosing was complete. They appeared to recover completely over the observation period but the brain was not examined microscopically. Some of these animals showed hepatocellular vacuolation consistent with fatty change. Screening tests of clotting function showed some impairment of clotting in some animals, which may have been due to impaired liver function. No further consistent or significant haematological abnormality was detected.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test condition	:	Number of animals: 14; 7 male and 7 female Application: undiluted material
Test substance	:	Impurities: 0.5 % diester 1.25 % water 1.0 % ethylene glycol Stabilization: 200 ppm methyl ether of hydroquinone
Reliability	:	(2) valid with restrictions

10.03.1997 (38)

Species	:	rat
Sex	:	no data
Strain	:	no data
Route of admin.	:	oral unspecified
Exposure period	:	4 month
Frequency of treatment	:	not mentioned
Post obs. period	:	not mentioned
Doses	:	0.5, 2.5 and 12.5 mg/kg/d
Control group	:	yes
NOAEL	:	= .5 mg/kg bw
Method	:	other: no data
Year	:	1987
GLP	:	no data
Test substance	:	no data
Result	:	The chronic administration of the substance produced decreased body weight and caused pathological changes in the liver, spleen, heart, and stomach. 0.5 mg/kg/d was nontoxic. In pregnant rats, 2.5 mg/kg/d increased embryo mortality; 12.5 mg/kg/d had mutagenic effects on spermatozoa. No teratogenic effects have been seen.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability	:	(3) invalid Documentation insufficient for assessment e.g. the purity of the substance tested is missing, number of animals used in

this study is missing.

18.02.1997 (139)

Species	:	rabbit
Sex	:	no data
Strain	:	no data
Route of admin.	:	dermal
Exposure period	:	7 days
Frequency of treatment	:	twice a day
Post obs. period	:	7 days
Doses	:	30 ul, aqueous solution of 35 wt%
Control group	:	yes
Method	:	other: no data
Year	:	1990
GLP	:	no
Test substance	:	no data
Result	:	No obvious morphological changes were recognized in the shaved skin of rabbits after repeated application of HEMA. HEMA caused insignificant irritation to the dermis. Histopathology of skin only.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability	:	(2) valid with restrictions Study well documented, meets generally accepted scientific principles, acceptable for assessment.

03.04.1997 (68)

5.5 GENETIC TOXICITY 'IN VITRO'

Type	:	Bacterial reverse mutation assay
System of testing	:	Salmonella typhimurium, TA100, TA1535, TA98, TA1537, Escherichia coli WP2 uvrA
Concentration	:	-S9 mix; 0, 313, 625, 1250, 2500, 5000ug/plate (five strains) +S9 mix; 0, 313 - 5000 ug/plate (five strains)
Cycotoxic conc.	:	Toxicity was not obserbed up to 5000 ug/plate in five strains with or without S9 mix..
Metabolic activation	:	with and without
Result	:	
Method	:	other: Guidelines for Screening Mutagenicity Testing of Chemicals and OECD Test Guideline 471 and 472
Year	:	1997
GLP	:	yes
Test substance	:	other TS: Nippon shokubai, Purity 97.6%
Remark	:	Procedures : Pre-incubation method Solvent : Water Positive controls : -S9 mix, 2-(2-Furyl)-3-(5-nitro-2-furyl) acrylamide (TA100, TA98, WP2), Sodium azide (TA1535) and 9-Aminoacridine (TA1537) +S9 mix, 2-Aminoanthracene (five strains) S9 : Rat liver, induced with phenobarbital and 5,6-benzoflavone Plates/test : 3 Number of replicates : 2
Result	:	This substance was not mutagenic in Salmonella typhimurium TA100, TA1535, TA98, TA1537 and Escherichia coli WP2 uvrA with or without S9 mix. Toxicity was not obserbed at 5000 ug/plate in five strains with or without an S9 mix.

Conclusion : This chemical did not induce mutations in the S. typhimurium and E. coli strains.
Reliability : (1) valid without restriction
Well conducted study, carried out by the Hatano research Institute, Food and Drug Safety Center (Japan).
Flag : Critical study for SIDS endpoint
23.03.2001 (74)

Type : Chromosomal aberration test
System of testing : Type of cell used : Chinese hamster lung (CHL/IU) cells
Concentration : -S9 mix (continuous treatment):0, 0.16, 0.33, 0.65, 1.3 mg/ml
-S9 mix (short-term treatment):0, 0.33, 0.65, 1.3 mg/ml
+S9 mix (short-term treatment):0, 0.33, 0.65, 1.3 mg/ml
Cycotoxic conc. : Toxicity was not observed up to 0.65 mg/ml in continuous and short-term treatment with or without S9 mix.
Metabolic activation : with and without
Result :
Method : other: Guidelinelines for Screening Mutagenicity Testing of Chemicals (japan) and OECD Guideline (No.473)
Year : 1997
GLP : yes
Test substance : other TS: Nippon shokubai, Purity 97.6%
Remark : Solvent : Distilled water
Positive controls : -S9 mix, Mitomycin C
+S9 mix, Cyclophosphamide
S-9 : Rat liver, induced with phenobarbital and 5,6-benzoflavone
Plates/test : 2
Result : Structural chromosomal aberrations (including gap) were induced under the following conditions: 24 h continuous treatment (0.65 and 1.3 mg/ml: mid and high concentrations, 10.0 and 70.6%, respectively); 48 h continuous treatment (0.16 - 0.65 mg/ml: all concentrations, 6.0 - 84.0%); short-term treatment with an exogenous metabolic activation system (1.3 mg/ml: high concentration, 13.0%). Polyploidy was induced under the following conditions: the 48 h continuous treatment (0.65 mg/ml, 3.25%); short-term treatment with an exogenous metabolic activation system (0.65 mg/ml: mid concentration, 1.25%); short-term treatment without the metabolic activation system (0.33 and 1.3 mg/ml: low and high concentrations, 0.88 and 6.13%, respectively). However, a trend test showed no dose-dependency for the polyploidy with short-term treatment and the metabolic activation system.

Lowest concentration producing cytogenetic effects in vitro:

Without metabolic activation (continuous treatment) :0.16 mg/ml (clastogenicity), :0.65 mg/ml (polyploidy)
Without metabolic activation (short-term treatment) :0.33 mg/ml (polyploidy)
With metabolic activation (short-term treatment) :1.3 mg/ml (clastogenicity), :0.65 mg/ml (polyploidy)
Reliability : (1) valid without restriction
Well conducted study, carried out by the Hatano research Institute, Food and Drug Safety Center (Japan).
Flag : Critical study for SIDS endpoint
10.08.2001 (74)

Type	:	Ames test
System of testing	:	Salmonella typhimurium TA 97a, TA 97, TA 100, TA 102 and TA 104
Concentration	:	0 - 25 mg/plate
Cycotoxic conc.	:	
Metabolic activation	:	with and without
Result	:	negative
Method	:	other: according to Maron D.M. and Ames B.N. (Mutation Res. 113: 173 - 215 (1983)
Year	:	1994
GLP	:	no data
Test substance	:	
Remark	:	Metabolic activation system S9-mix: prepared from rat liver microsomes
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability	:	(2) valid with restrictions Study well documented, meets generally accepted scientific principles, acceptable for assessment.
Flag	:	Critical study for SIDS endpoint

10.08.2001 (128)

Type	:	Ames test
System of testing	:	Salmonella typhimurium TA 1535, TA 1537, TA 1538, TA 98, TA 100
Concentration	:	40 - 2500 ug/plate
Cycotoxic conc.	:	
Metabolic activation	:	with and without
Result	:	negative
Method	:	other: no data as OECD 471
Year	:	1984
GLP	:	no
Test substance	:	
Remark	:	Metabolic activation system S9-mix: prepared from phenobarbital-induced rats and Aroclor-1254-induced rats
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Test substance	:	Purity: > 99 %
Reliability	:	(2) valid with restrictions Method sufficiently described.

12.02.1997 (140)

Type	:	Ames test
System of testing	:	Salmonella typhimurium TA98 and TA100
Concentration	:	0.2 to 1000 ug/ml
Cycotoxic conc.	:	
Metabolic activation	:	with and without
Result	:	negative
Method	:	
Year	:	1980
GLP	:	no data
Test substance	:	no data
Remark	:	An occasional increase in the number of revertants over the control level was observed with TA100 in the activated tests. However, this increase was not consistent or dose-related.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability	:	(2) valid with restrictions Only summary of the toxicological study available. Without detail documentation but acceptable for assessment.

27.01.1997 (9)

Type	:	other: DNA synthesis inhibition test (DIT)
System of testing	:	HeLa S3-cells
Concentration	:	
Cycotoxic conc.	:	
Metabolic activation	:	
Result	:	negative
Method	:	
Year	:	1995
GLP	:	no data
Test substance	:	no data
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability	:	(3) invalid No description of the purity of the test substance, no description of the test concentrations.

11.03.1997 (60)

23.01.2001

5.6 GENETIC TOXICITY 'IN VIVO'

Type	:	Micronucleus assay
Species	:	rat
Sex	:	male
Strain	:	Sprague-Dawley
Route of admin.	:	gavage
Exposure period	:	2 days
Doses	:	500, 1000 and 2000 mg/kg
Result	:	
Method	:	OECD Guide-line 474 "Genetic Toxicology: Micronucleus Test"
Year	:	2001
GLP	:	yes
Test substance	:	other TS: Mitsubishi Rayon, purity 99.7%
Remark	:	1.Negative control substance: Water for injection 2.Positive control substance: Cyclophosphamide 3.Experimental animals Thirty-one male SD [Crj: CD(SD)IGS, SPF] rats were obtained from Charles River Japan Inc., on November 22, 2000. Healthy rats were used in this study after quarantine and acclimation for six days. They were grouped by the stratified-by-weight randomization method before administration to give approximately equal group mean body weights. They were seven weeks old and weighed from 259 to 282 g on the day of administration. 4.Number of animals: Five rats per group were used. 5.Body weight The animals were weighted just before administration and before preparation of specimen. 6.Observation of clinical sign The animals were observed once or more per day of administration and preparation of specimen. 7.Sampling time The animals in each group were sacrificed 24-hours after the final administration. 8.Experimental design The experimental design in the micronucleus test is as

follows.

Treatment group	Dose(mg/kg)	Times	Animal Number
Negative control (Water for injection)	0	2	1-5
Test substance			
(low dose)	500	2	6-10
(middle dose)	1000	2	11-15
(high dose)	2000	2	16-20
Positive control(CP)	10	1	21-25

8 Preparation of specimen
Each rat was sacrificed by exsanguination from the abdominal aorta under anesthethesia with Ravonala (Tanabe Seiyaku Co., Ltd. lot no. 07004) and the femurs were dissected out. The bone marrow cells were collected with PBS(-) (Nissui Pharmaceutical Co., Ltd.). The cells were centrifuged at 200 rpm for 5 min and were taken the supernatant. It was resuspended in 10% buffered formalin (Muto Pure Chemicals, Co., Ltd.) and was centrifuged at 1000 rpm for 5 min. After centrifugation, the cells were washed twice. Then, the cells were resusupended in a small amount of 10% buffered formalin, and was stocked. The bone marrow suspension was stained with acridine orange, and was spread on a clean slide glass.
9.Observation of slides
Slides were examined under blind condition and scored under a fluorescent microscope with B-2 excitation filter. One thousand erythrocytes were scored from each slide in order to determine the ratio of polychromatic erythrocytes (PCEs) to the total erythrocytes [PCEs and normochromatic erythrocytes (NCEs)]. PCEs were further scored up to 2000 cells, the number of micronucleated PCEs (MNPCEs) in a slide were examined (2 area, Total 2000 cells). PCEs and NCEs were identified according to the method of Hayashi et al1.

10.Statistical analysis
For the analysis of the percentage of PCEs, Student's t-test were applied. For the incidence of MNPCEs, tables of Kastenbaum and Bowman2 were applied.

11.Data evaluation
Only when a test substance was induce a significant increase in the total number of MNPCEs with a dose-dependently, the test substance was considered positive in this assay.

Result : There were no significantly differences in the incidence of MNPCEs between any treatment group and the negative control group.
They increased significant in the incidences of PCEs between 1000 mg/kg group and the negative control group ($p<0.05$).
The change for clinical signs were not observed with all of test substance groups.
The negative control incidences of MNPCEs among tests was within the range of our laboratory background data and positive control ones showed remarkable increase. These findings indicated that the test was conducted appropriately. This chemical does not induce micronuclei under the test conditions employed.

Reliability : (1) valid without restriction
Well conducted study, carried out by the Mitsubishi Chemical Safety Institute Ltd. (Japan).

Flag : Critical study for SIDS endpoint
23.03.2001 (78)

5.7 CARCINOGENITY

5.8 TOXICITY TO REPRODUCTION

Type	:	other: OECD Combined Repeat Dose and Reproductive/Developmental Toxicity Screening Test
Species	:	rat
Sex	:	male/female
Strain	:	Crj: CD(SD)
Route of admin.	:	gavage
Exposure period	:	Males, 49 days Females, from 14 days before mating to day 3 of lactation
Frequency of treatment	:	Once daily
Premating exposure period		
Male	:	14 days
Female	:	14 days
Duration of test	:	Male, 50 days Females, day 4 of lactation
Doses	:	0 (vehicle), 30, 100, 300, 1000 mg/kg/day
Control group	:	yes, concurrent vehicle
NOAEL Parental	:	>= 1000 ml/kg bw
NOAEL F1 Offspr.	:	>= 1000 ml/kg bw
Method	:	OECD combined repeated dose and reproductive/developmental toxicity screening test
Year	:	1997
GLP	:	yes
Test substance	:	other TS: Nippon shokubai, Purity 97.6%
Remark	:	There were no effects of the test substance on the estrus frequency, copulation index, number of conceiving days, fertility index, length of gestation, number of corpora lutea or gestation index. There were no effects of the test substance on the number of live pups born, birth index, number of dead pups, number of pups born, delivery index, live birth index, sex ratio, viability index, external anomalies, body weight or necropsy findings. The NOAELs for the reproductive/developmental toxicity are considered to be 1000 mg/kg/day for reproduction in both sexes as well as for development of pups.
Reliability	:	(1) valid without restriction Well conducted study, carried out by Nippon Bioresearch Inc. Hashima Laboratory (Japan).
Flag	:	Critical study for SIDS endpoint

17.01.2001 (74)

Type	:	One generation study
Species	:	rat
Sex	:	male/female
Strain	:	other: no data
Route of admin.	:	oral unspecified

Exposure period	:	not mentioned
Frequency of treatment	:	not mentioned
Premating exposure period		
Male	:	not mentioned
Female	:	not mentioned
Duration of test	:	
Doses	:	0.5, 2.5 and 12.5 mg/kg/d
Control group	:	yes
Method	:	other: no data
Year	:	1987
GLP	:	no data
Test substance	:	no data
Result	:	The chronic administration of the substance produced decreased body weight and caused pathological changes in the liver, spleen, heart, and stomach. 0.5 mg/kg/d was nontoxic. In pregnant rats, 0.5 mg/kg/d was neither embryotoxic nor mutagenic. 2.5 mg/kg/d increased embryo mortality; 12.5 mg/kg/d had mutagenic effects on spermatozoa. No teratogenic effects have been seen.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability	:	(3) invalid Documentation insufficient for assessment e.g. the purity of the substance tested is missing, number of animals used in this study is missing.

18.02.1997 (139)

5.9 DEVELOPMENTAL TOXICITY/TERATOGENICITY

5.10 OTHER RELEVANT INFORMATION

Type	:	Cytotoxicity
Remark	:	The effect of 2-hydroxyethyl methacrylate on human fibroblasts was tested. The HEMA concentrations used were 0.01 - 1 % at incubation times of 1 - 24 h. The cells were observed with AVEC-DIC (Allen video-enhanced contrast differential interference contrast) microscopy and fluorescent staining to evaluate the velocity of lysosomal movement, the number and morphology of the mitochondria, and the fine structure of the cell. The average velocity in untreated control cells was 1.27 +/- 0.16 um/s (+/-SD; n= 30). HEMA at concentrations of 0.1% and 0.3 % increased the lysosome velocity within 2 h to 2.32 +/- 0.33 um/s and 2.62 +/- 0.48 um/s, respectively. After 3 h the values had decreased somewhat. Both the number of the moving lysosomes and their velocity were reduced. After 6 h cell death was observed in all samples. Cytotoxicity was observed at concentrations of >= 1 %.
Source	:	Roehm GmbH Darmstadt EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

24.03.1994 (65)

Type	:	Cytotoxicity
Remark	:	The effect of 2-hydroxyethyl methacrylate on human

fibroblasts (WI38) was tested. The application of video- and fluoresce microscopy showed that HEMA caused concentration-dependent and time-dependent changes with respect to the properties of motile vesicles and of the fine morphology. The HEMA concentrations used were 0.01, 0.05 and 0.1 % at incubation times of 1 - 4 h. Typical effects observed in the majority of treated cells were changes in cell shape. During the second hour after HEMA application in all three concentrations ruffling activity and microspike flexing movements were increased. The effects of HEMA on the velocity of organelles were analysed using image analysis. Following HEMA application vesicles accelerated and displayed mean velocities of 3.18 um/s. The average velocity in untreated control cells was 2.03 um/s. Only at the lowest concentration of HEMA used (0.01 %) was an increase of motile events observed. At higher concentrations, the number of motile vesicles was reduced over the whole incubation period in a concentration- and time-dependent manner.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (2) valid with restrictions
Documentation sufficient for assessment.

12.02.1997 (33)

Type : Cytotoxicity

Remark : Human gingival carcinoma derived epithelial cell lines (Ca 9.22) were incubated with various concentrations of 2-Hydroxyethyl methacrylate for 24 hours. The concentration giving 10 % inhibition of cell growth was 250 ug/ml. The no effect concentration was 30 ug/ml, respectively.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (4) not assignable
Only abstract and tables in english.

13.02.1997 (39)

Type : Cytotoxicity

Remark : Adverse effects of Hydroxyethyl methacrylate on cell culture (Ca. 9.22.) were examined by phase contrast, scanning electron and transmission electron microscopies. The cell line was incubated with various concentrations of HEMA for 24 hours. The concentration giving negligible effects was 10 ul/ml.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (4) not assignable
Only abstract and tables in english.

11.03.1997 (142)

Type : Cytotoxicity

Remark : The effect of 2-Hydroxyethyl methacrylate on rat liver hepatocytes was tested. The HEMA concentrations used were 0.003, 0.01, 0.030, 0.100, 0.300, 1.000, 3.000 and 10.000 mM at an incubation time of 24 hours at 37 °C. The XTT-test is a colorimetric method which determins the cell proliferation and the number of survived cells after incubation with the test substance. No cytotoxic signs were seen up to a concentratiom of 3.000 mM. 10.000 mM HEMA were

cytotoxic to the hepatocytes under the present test conditions.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (2) valid with restrictions
Test procedure in accordance with national standard methods with acceptable restrictions, Screening-test.

18.04.1997 (111)

Type : Metabolism
Remark : Enzymatic hydrolysis:
Hydroxyethyl methacrylate was hydrolyzed with nonspecific pocine liver esterase and analyzed by ion chromatography to establish the sensitivity of the enzyme simulator. The hydrolytic reactions were under enzyme-limited conditions to ease direct sampling for ion chromatographic analysis.
Time dependent hydrolysis of the monomer was observed. Hydroxyethyl methacrylate hydrolyzed more than 80 % in a 1 day period. The half-life for esterase hydrolysis of HEMA was 9.3 hours.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (2) valid with restrictions
Documentation sufficient for assessment.

17.04.1997 (5)

Type : Metabolism
Remark : Small quantities of methacrylates may readily be metabolized by saponification into the alcohol and methacrylic acid. The latter may form an acetyl-coenzyme derivative, which then enters the normal lipid metabolism.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

02.04.1997 (12)

Type : other
Remark : In in vitro examinations the activity upon the isolated, perfused rabbit heart in the perfusing fluid at concentrations of 1:1000, 1:10000 and 1:100000 (v/v) was investigated. The compound reduced the heart rate and force of contraction and increased the coronary flow rate.
2-Hydroxyethyl methacrylate produced an irreversible effect on the isolated heart at the 1:1000 concentration but not at lower concentrations.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

24.05.1994 (75)

Type : other
Remark : 2-Hydroxyethyl methacrylate was tesed for it's effects upon contraction of the isolated guinea pig ileum. Test concentration levels: 1:2500, 1:5000 and 1:10000 (v/v). The test substance produced an inhibition of spontaneous contractions of the isolated ileum which antagonized the stimulant actions of both acetylcholine and barium chloride. The compound demonstrated concentration-dependent responses.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

31.05.1994 (77)

Type : other
Remark : Hydroxyethyl methacrylate used at 0.01 - 1 % concentrations was found to alter the fine structure of cultured cells with quantitative video microscopy. The result was regarded by the authors as indicating a potential irritating effect.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
21.03.1994 (79)

Type : other
Remark : 2-Hydroxyethyl methacrylate was tested for it's effects upon contraction of the isolated guinea pig ileum. Test concentration levels: 1:2500, 1:5000 and 1:10000 (v/v). The test substance produced an inhibition of spontaneous contractions of the isolated ileum which antagonized the stimulant actions of both acetylcholine and barium chloride. The compound demonstrated concentration-dependent responses.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
10.03.1997 (77)

Type : other
Remark : Hydroxyethyl methacrylate used at 0.01 - 1 % concentrations was found to alter the fine structure of cultured cells with quantitative video microscopy. The result was regarded by the authors as indicating a potential irritating effect.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
08.10.1996 (79)

Type : other
Remark : Seven mongrel dogs underwent transfemoral catheterization of the common carotid artery and subsequent injection of a hydroxyethyl methacrylate containing preparation in volumes of 1 ml in five dogs, 2 ml in one, and 4 ml in one. Angiography performed at the time of injection revealed evidence of intravascular thrombosis as well as possible spasm. The animals injected with 2 or 4 cc hydroxyethyl methacrylate solution did not surive 48 hours. Five of the seven animals had histopathologically documented cerebral infarctions of varying size. However, the authors conclude that it is unclear wether the observed reactions can be attributed to hydroxyethyl methacrylate.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
08.10.1996 (87)

Type : other: in vitro adsorption to dentin
Remark : Adsorption of HEMA on bovine dentin powder from aqueous solution was examined. The amount of HEMA adsorbed was calculated from the difference between the concentrations before and after shaking. Adsorbate solutions without adsorbent and a water suspension were simultaneously shaken (72 h) and their absorbances were determined to correct the amount of adsorption. HEMA was completely adsorbed on the dentin powder from solutions with initial concentrations

less than 0.01 %. Adsorption at equilibrium concentrations more than ca. 1.54 mol/l stayed constant at ca. 6.4 umol/m2 (ca. 2.5 % HEMA).
It was demonstrated by the adsorption measurement, that HEMA was able to infiltrate into intertubular dentin from aqueous solutions.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

24.03.1994 (36)

5.11 EXPERIENCE WITH HUMAN EXPOSURE

Memo : Skin sensitization
Remark : 22 patients (19 women and 3 men) classified with the burning mouth syndrome (BMS) were patch tested with a standard routine series and a standardized denture-dental ((meth)acrylate and metal) series. Twenty of the 22 patients wore a complete or partial denture. None of the 22 patients showed a positive reaction to the tested methacrylates (Methyl methacrylate, Ethyl methacrylate, 2-Hydroxyethyl methacrylate, 2-Hydroxypropyl methacrylate, Ethylene glycol dimethacrylate 2 % in pet.).
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
Study well documented, meets generally accepted scientific principles, acceptable for assessment.

03.04.1997 (23)

Memo : Skin sensitization, case report
Remark : In the year 1994, 193 patients with complaints of the oral mucosa and/ or suspected contact allergy to denture materials were patch tested in the departments of Dermatology in Germany (IVDK).
Among the examined patients, a positive patch-test reaction against 2-Hydroxyethyl methacrylate (1.0 % in vas.) was found in 4 patients.
However, the epidemiological value of these data is limited.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (3) invalid
Documentation insufficient for assessment.

22.04.1997 (30)

Memo : Skin sensitization, case report
Remark : The results of patch tests with an acrylate series (29 chemical compounds (Chemotechnique Diagnostics AB)) in 8 (3.4 %) out of 235 patients with occupational dermatitis were presented. The group of patients consisted of four dentists - prosthodontists and four dental technicians.
Altogether there were 38 positve patch tests.
4 positive patch tests were seen with 2-Hydroxyethyl methacrylate (2 % in vas.).
However, the epidemiological value of these data is limited.
Cross-reactivity was not excluded.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (4) not assignable

Only abstract in english. Literature is writen in polish.

04.02.1997 (55)

Memo : Skin sensitization, case report
Remark : A 38-year-old woman who became sensitized to a 2-component acrylic adhesive containing 2-hydroxyethyl methacrylate (2-HEMA) and polyurethane (Penloc GZH glue) was patch tested. Her glue was analysed by gas chromatography/mass spectrometry (GC/MS) and contained 24.6 % 2-HEMA and 0.4 % ethylene glycol dimethacrylate. Both compounds, as well as her glue, provoked an allergic patch test reaction. Her own Penloc GZH glue gave strong allergic patch test reactions in all dilutions (2 %, 0.6 %, and 0.2 %). Also many other acrylate and methacrylate compounds, gave an allergic reaction indicating cross-allergy, but also concomitant sensitization.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
Study well documented, meets generally accepted scientific principles, acceptable for assessment.

03.04.1997 (50)

Memo : Skin sensitization, case report
Remark : A 38-year-old woman had been working as a dental nurse for 14 years. She had no histroy of personel or family atopy, or previous skin symptoms. She was sensitized from patch testing with the compounents of the dental adhesive system at too high concentrations, i.g. undiluted. Sensitization was verified on retesting; the patient showed an allergic patch test reaction to 2-Hydroxyethyl methacrylate, and the dental adhesive system containing 2-hydroxyethyl methacrylate (2-HEMA) and 2,2-bis (4-(2-hydroxy-3-methacryl-oxypropoxy) phenyl) propane (BIS-GMA). Patch testing was performed with the 2 dental adhesive systems (Scotchprep dentin primer and Scotchbond 2 light cure dental adhesive). Ingredients and pH of the components of the 2 dental adhesive systems according to the material safety data sheet:

Scotchprep dentin primer: 2-HEMA 30 - 65 %
Maleic acid < 5 %
Water 30 - 40 %
Methacrylic acid < 18 %
Ethylene glycol < 13 %
pH 1.5

Scotchbond 2 light cure dental adhesive:
BIS-GMA 50 - 60 %
2-HEMA 40 - 50 %
Amorphous silica 4 - 6 %
2,3-Bornanedione < 1 %
4-(Dimethylamino) phenethyl alcohol < 1 %
pH 7

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
Study well documented, meets generally accepted scientific principles, acceptable for assessment.

03.04.1997 (52)

Memo : Skin sensitization, case report
Remark : A 39-year-old woman was sensitized to a primer containing 2-Hydroxyethyl methacrylate and BIS-GMA in an adhesive system. Patch testing with BIS-GMA, 2-HEMA and Triethyleneglycol dimethacrylat (TEGMA) showed strong positive reactions to HEMA and TEGMA. The latter may be due to cross-reactivity between the 2 methacrylates.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
05.02.1997 (1)

Memo : Skin sensitization, case report
Remark : A 31-year-old woman became sensitized to Ethyl acrylate, 2-Hydroxyethyl acrylate and 2-Hydroxypropyl acrylate. This was confirmed on retesting but on day 13, after retesting, the patient developed further positive acrylate and methacrylate patch reactions indicating that the second patch test session sensitized her - at least Ethyl methacrylate and Triethyleneglycol diacrylate. A weak positive patch test reaction was seen with 2-HEMA.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (3) invalid
10.02.1997 (47)

Memo : Skin sensitization, case report
Remark : A 35-year-old nurse developed a florid eczema 9 months after starting treatement with Transcutaneous electrical nerve stimulation (TENS). She was patch tested with the European standard series (Chemotechnique Diagnostics AB) and the TENS accessories. A positive result was found with 2-Hydroxyethyl methacrylate (2 % pet.) which was a Copolymer of the hydropad used. The autors concluded that the patient's eczema was the result of her sensitivity to 2-Hydroxyethyl methacrylate.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (3) invalid
Documentation insufficient for assessment.
03.04.1997 (70)

Memo : Skin sensitization, case report
Remark : 3 carpenters frequently using wood paints and glues were patch tested. 1 of them showed a positive patch test reaction against 2-Hydroxyethyl methacrylate.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (3) invalid
Documentation insufficient for assessment (Review).
10.02.1997 (133)

Memo : Skin sensitization, case report
Remark : A 17-year-old woman had been working for 6 months in the manufacture and application of sculptured nails. She developed an allergic contact dermatitis to artifical nails. She had a previous history of metal allergy and she had used sculpured nails before without problems. The patient was

patch tested with a standard series and with plastics and methacrylates. The woman showed positive patch test reactions to Hydroxyethyl methacrylate (2 % in pet.), Methyl methacrylate (10 % in pet.) and Ethyl methacrylate (10 % in pet.) after 48 and 96 hours.
20 controls were negative to Prains (natural nail which is pained with an acrylic compound), cavity primer and Kadon.
Cross reactivity is probable.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (4) not assignable
Documentation insufficient for assessment. The ingredients of the artificial nails handeled are not mentioned.

02.04.1997 (17)

Memo : Skin sensitization, case report

Remark : A 24-year-old hairdresser and manicurist had had nearly constant hand eczema for 6 years. She was patch tested with the European standard series, a hairdresser series, an acrylates series (Chemotechnique) and her nail glue 10 % in pet.. She reacted to Hydroxyethyl methacrylate and her cyanoacrylate glue. Cross-reactions are possible.
15 controls were tested with the same dilution of cyanoacrylate glue over the following 2 weeks. They were negative with the exception of 1 weak irritant reaction on an elderly patient with dry skin.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (3) invalid
Documentation insufficient for assessment.

22.04.1997 (41)

Memo : Skin sensitization, case report

Remark : A 48-year-old female silk-screen printer had worked in the manufacture of circuit boards for 12 years before she got the first symptoms of dermatitis on her wrists and lower arms. A patch test session revealed allergic reactions to several acrylics, several epoxy compounds and 3 ink components. She also showed a positive patch test reaction to 2-Hydroxyethyl methacrylate (2 % w/w in pet.).

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (3) invalid
It is not possible to determine which reactions represented cross-reactions, and which concomitant reactions.

22.04.1997 (42)

Memo : Skin sensitization, case reports

Remark : Among 1619 patients suspected of occupational contact dermatitis examined during the years 1990 - 1994, 23 were exposed to acrylates. Occupational allergic contact dermatitis was diagnosed in 332 patients. 9 of them were sensitive to one or more acrylate compounds.
4 of these 9 patients (sensitive to acrylic resins) showed a positive patch test reaction when tested with 2 % 2-Hydroxyethyl methacrylate.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (2) valid with restrictions

Documentation sufficient for assessment.

12.03.1997 (54)

Memo : Skin sensitization, case reports
Remark : From 01.08.1992 to 31.07.1994, 756 patients with complaints of the oral mucosa and/ or suspected contact allergy to denture materials were patch tested in the departments of Dermatology in Germany (IVDK). Among these patients, women were overrepresented, while individuals with atopic dermatitis were underrepresented.
Among the examined patients, a positive patch-test reaction was found in 3 patients.
However, the epidemiological value of these data is limited.
Cross-reactivity was not excluded.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
Documentation sufficient for assessment.

23.04.1997 (92)

Memo : Skin sensitization, case reports
Remark : Eight dental personnel have been seen to be sensitized to components of Scotchbond 2 Dental Adhesive System (SB-2-DAS) based on maleic acid and 2-Hydroxyethyl methacrylate.
SB-2-DAS bonds patented in 1988 anterior and posterior dental composite resin to tooth structure and features two no-mix formulas: the Scotchbond dentin primer (SDP) containing 30 - 65 % HEMA and the Scotchbond 2 light cure dental adhesive (SB-2) containing 40 - 50 % 2-HEMA and 50 - 60 % BIS-GMA.
All patients showed a positive patch test patch test reaction to components of SB-2-DAS (1 % w/w pet.). All patients had also positive patch test reactions to 2-Hydroxyethyl methacrylate, but none to 2,2-bis (4-(2-hydroxy-3-methacryl-oxypropoxy) phenyl) propane (BIS-GMA) or any other epoxy acrylate in the methacrylate series (Chemotechnique). 4 out of 8 of the allergic patients complained of paresthesia which has been reversible. 6 of these cases have already been described by Kanerva et al. 1991.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (4) not assignable
Documentation insufficient for assessment.

03.04.1997 (44)

Memo : Skin sensitization, case reports
Remark : 3 dental nurses and 3 dentists developed allergic contact dermatitis from a dentin adhesion promotor system in 1988 - 1990.
Patch testing was performed with the 2 dental adhesive systems (Scotchprep dentin primer and Scotchbond 2 light cure dental adhesive 1 % in pet.) and all 6 patients showed a positive reaction.
Ingredients and pH of the components of the 2 dental adhesive systems according to the material safety data sheet:
Scotchprep dentin primer: 2-HEMA 30 - 65 %
Maleic acid < 5 %

Water 30 - 40 %
Methacrylic acid < 18 %
Ethylene glycol < 13 %
pH 1.5
Scotchbond 2 light cure dental adhesive:
BIS-GMA 50 - 60 %
2-HEMA 40 - 50 %
Amorphous silica 4 - 6 %
2,3-Bornanedione < 1 %
4-(Dimethylamino) phenethyl alcohol < 1 %
pH 7
Although in patch testing with 2-Hydroxyethyl methacrylate (2 % in pet.) all 6 patients had positive reactions.
None of the controls showed an irritant reaction when tested with the resin components (1 % in petrolatum) and no one was sensitized.
Patient No. 5 was described in detail by Kanerva L. et al.; Allergy 47: 571 - 573 (1992)

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (2) valid with restrictions
Documentation sufficient for assessment.

11.02.1997 (43) (51)

Memo : Skin sensitization, case reports

Remark : From Nov. 1989 to Jan. 1994, 27 dental technicans with suspected contact allergy to denture materials were patch tested in the departments of Dermatology in Germany (IVDK). Among the examined patients, positive patch-test reactions to 2-Hydroxyethyl methacrylate were found in 10 patients (37 %).
However, the epidemiological value of these data is limited.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (4) not assignable
Documentation insufficient for assessment.

03.04.1997 (125)

Memo : Skin sensitization, case reports

Remark : 3 patients with a typ-IV-sensitization to a mixture of liquid acrylates in a nail-varnish-hardener showed also a positive reaction to Hydroxyethyl methacrylate.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (4) not assignable
Only very short summary available. Test concentrations not mentioned. Cross-reactivity possible.

03.04.1997 (18)

Memo : Skin sensitization, case reports

Remark : 33 (1.9 %) of 1,813 patiens tested in German dermatological clinics for possible contact allergy to Hydroxyethyl methacrylate showed a positive reaction. 17 of these 33 patients were dental technicians.

Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)

Reliability : (2) valid with restrictions
Collection of data.

23.04.1997 (126)

Memo : Skin sensitization, irritation, case reports
Remark : 55 dental technicians (DT) with suspected occupational skin disease (OSD) were examined between February 1993 and June 1994 and patch tested with the standard series, an extensive series of methacrylates.
Among the 55 DT examined, allergic contact dermatitis was diagnosed in 63.6 % and irritant contact dermatitis in 23.6 %. 18 patients (33 %) showed a positive patch test reaction against 2-Hydroxyethyl methacrylate (2 % in pet.).
In 16 patients, multiple sensitization to various methacrylates were found. So it is imposible to distinguish between concomitant sensitization and cross-reactivity.
2-Hydroxyethyl methacrylate has both a sensitizing and a cross-reacting potential.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (2) valid with restrictions
Documentation sufficient for assessment.

13.02.1997 (107)

Memo : Skin sensitization, irritation, case reports
Remark : From 02/93 to 12/95, 93 dental technicians (DT) with suspected occupational skin disease (OSD) were examined.
Among 93 DT examined, allergic contact dermatitis was diagnosed in 50 %, irritant contact dermatitis in 29 % and atopic hand dermatitis in 15 % of the patients.
2 % showed a mixture of irritative and allergic contact dermatitis.
27 patients showed a positive patch test reaction to 2-Hydroxyethyl methacrylate, 27 patients were positive to Ethylenglycol dimethacrylat, 17 patient reacted to Methyl methacrylate, 16 patients had a positive reaction to 2-Hydroxypropyl methacrylate and 16 patients were positive to Ethyl methacrylate. In 26 patients, multiple sensitization to various methacrylates were found. So it is impossible to distinguish between concomitant sensitization and cross-reactivity.
Source : Roehm GmbH Darmstadt
EUROPEAN COMMISSION - European Chemicals Bureau Ispra (VA)
Reliability : (3) invalid
Documentation insufficient for assessment.

03.04.1997 (84)

(1) Agner T., Menné T; Sensitization to acrylates in a dental patient; Contact Dermatitis 30: 249 - 250 (1994)

(2) Aldrich; Katalog Handbuch Feinchemikalien, Aldrich-Chemie GmbH & Co.KG, 7924 Steinheim, Germany: 916 (1992-1993)

(3) Andersen K.E.; Systemic symptoms related to patch tests with UV curable acrylic monomers; short communication; Contact Dermatitis 14: 180 (1986)

(4) Andrzejewska E., Kusch P., Andrzejewski M.; Thermal decomposition of crosslinked polymers of some dimethacrylate esters; Polymer Degradation and Stability 40: 27 - 30 (1993)

(5) Bean T.A., Zhuang W.C., Tong P.Y., Eick J.D., Yourtee D.M.: Effect of esterase on methacrylates and methacrylate polymers in an enzyme simulator for biodurability and biocompatibility testing; Journal of Biomedical Materials Research 28: 59 - 63 (1994)

(6) Biodegradation and Bioaccumulation; Data of Existing Chemicals based on the CSCL Japan; ed. by Chemicals inspection & testing institute Japan; publ. Japan Chemical industry ecology-toxicology & information center: 2-85 (1992)

(7) Bjoerkner B.; Contact Allergy to 2-Hydroxypropyl Methacrylate (2-HPMA) in an Ultraviolet Curable Ink; Acta Derm. Venerol (Stockh) 64(3): 264-267 (1984)

(8) Björkner B. in: Rycroft R.J.G., Menne T., Frosch P.J., Bernezra C.; Plastic Materials; Textbook of Contact Dermatitis (second edition), Springer Verlag, Berlin, Heidelberg, New York: 539 - 672 (1995)

(9) BP Chemicals Inc.: Initial Submission: Irritation and Mutagenicity tests of Hydroxyethyl methacrylate and related studies with cover letter dated 082892; Microfiche No.: OTS0556083; Carpanini Dr. F.M.B., date produced: 03/10/81

(10) Chemicals Inspection and Testing Institute, Japan. Report No.20924

(11) Chemicals Inspection and Testing Institute, Japan. Report No.80924K

(12) Clayton G.D., Clayton F.E.; Patty's Industrial Hygiene and Toxicology; Vol 2A, 3 rd. ed.: 2291-2302 (1981), John Wiley & Sons Inc., USA, ISBN: 0-471-16042-3

(13) Clemmensen S.; Cross-reaction patterns in guinea pigs sensitized to acrylic monomers; Drug and Chemical Toxicology 7(6): 527-540 (1984)

(14) Clemmensen S.; Sensitizing potential of 2-hydroxyethyl-methacrylate; Contact Dermatitis 12(4): 203-208 (1985)

(15) Conde-Salazar L., Guimaraens D., Romero L.V.; Occupational allergic contact dermatitis from anaerobic acrylic sealants; Contact Dermatitis 18: 129-132 (1988)

(16) Conde-Salazar L., Guimaraens D., Romero L.V.; Occupational allergic contact dermatitis from anaerobic sealants; Contact Dermatitis 15: 188-189 (1986)

(17) Condé-Salazar L., Guimarens D., Romero L.V., Gonzalez M.A., Alomar A.; Occupational allergic contact dermatitis to artificial nails; short communications; Contact Dermatitis 15: 242 (1986)

(18) Daecke C., Schaller J., Goos M.; Acrylate - ein Kunststoff mit zunehmender Bedeutung für Typ-IV-Sensibilisierungen; Zentralblatt Haut- und Geschlechtskrankheiten 163, Tagungsbericht: 163 (1993)

(18-1) Daubert et al, Physical and Thermodynamic Properties of Pure Chemicals Data Compilation. Washington, D.C.; Taylor and Francis, 1989.

(19) Deutsche Forschungsgemeinschaft; MAK- und BAT-Werte-Liste 1993; Senatskommission zur Pruefung gesundheitsschaedlicher Arbeitsstoffe (Mitteilung 29); VCH Verlagsgesellschaft mbH, Weinheim (1993); ISBN: 3-527-27561-4

(20) DFG (Deutsche Forschungsgemeinschaft); Gesundheitsschädliche Arbeitsstoffe Toxikologisch-arbeitsmedizinische Begründungen von MAK-Werten (22. Lieferung); VCH Verlagsgesellschaft mbH, Weinheim (1996); ISSN: 0930-1984

(21) DFG (Deutsche Forschungsgemeinschaft); MAK- und BAT-Werte-Liste 1996; Senatskommission zur Prüfung gesundheitsschädlicher Arbeitsstoffe (Mitteilung 32); VCH Verlagsgesellschaft mbH, Weinheim (1996); ISBN: 3-527-27571-1

(22) DIMDI Deutsches Institut fuer Medizinische Dokumentation und Information (09.07.1993), File: HSDB Hazardous Substances Data Bank; source: Dean J.A.; Handbook of Organic Chemistry, New York, NY: MCGRAW-Hill Book Co.: 1-256 (1987)

(23) Dutrée-Meulenberg R.O.G.M., Kozel M.M.A., Van Joost Th.; Burning mouth syndrome: A possible etiologic role for local contact hypersensitivity; Journal of the American Academy of Dermatology 26: 935 - 940 (1992)

(24) Endes G., Ebel S., Haller B.; Mikrobestimmung von Methacrylsäureestern mit Hilfe der GC/MS-Kopplung; Arch. Pharm. 8(327): 503 - 507 (1994)

(25) Environmental Agency of Japan (1997)

(26) Estlander T.; Occupational skin disease in Finland. Observation made during 1974-1988 at the Institute of Occupational Health, Helsiki; Acta Dermatol-Venereologica 155: 1-85 (1990)

(27) Fujisawa S., Kadoma Y., Mashuara E.; A calorimetric study of synthetic phospholipid liposomes with vinylmonomers, acrylates and methacrylates; J. Biomed. Mat. Res. 18: 1105-1114 (1984)

(28) Fujisawa S., Masuhara E.; Determination of partition coefficients of acrylates, methacrylates, and vinyl monomers using high performance liquid chromatography (HPLC); Journal of Biomedical Materials Research, Vol. 15: 787-793 (1981)

(29) Gage J.C.; The subacute Inhalation Toxicity of 109 Industrial Chemicals; Brit. J. Industr. Med. 27: 1-18 (1970)

(30) Gebhardt M., Gebhardt A., Wollina U.: Differentialdiagnostik Zahnprothesen-bezogener Beschwerden - Eine Übersicht; H + G 70: 738 - 744 (1995)

(31) Geiger D.L., Poirier S.H., Brooke L.T., Call D.J.; Acute Toxicities of Organic Chemicals to Faethead Minnows (Pimephales promelas); Vol. III, University of Wisconsin-Superior (1986)

(32) Geiger D.L., Poirier S.H., Brooke L.T., Call D.J.; Acute Toxicities of Organic Chemicals to Fathead Minnows (Pimephales promelas); Vol. III, University of Wisconsin-Superior (1986)

(33) Geisler B., Weiss D.G., Lindl T.; Video-Microscopic Analysis of the Cytotoxic Effects of Hydroxyethyl methacrylate on Diploid Human Fibroblasts; In Vitro Toxicology 8(4): 369 - 375 (1995)

(34) Gerrits P., Horobin R.W., Stokroos I.; The effects of glycol methacrylate as a dehydrating agent on the dimensional changes of liver tissue; Journal of Microscopy 165(2): 273-280 (1992)

(35) Guerra L., Vincenzi C., Peluso A.M., Tosti A.: Prevalence and sources of occupational contact sensitization to acrylates in Italy; Contact Dermatitis 28: 101-103 (1993)

(36) Harashima I., Hirasawa T.; Adsorption of 2-hydroxyethyl methacrylate on dentin from aqueous solution; Dent. Mater. J. 9(1): 36-46 (1990)

(37) Hayakawa R., Takeuchi Y., Kojima S.; Occupational Allergic Contact Dermatitis due to 2-Hydroxy-Ethyl-Methacrylate; Hifu 31(7): 17-23 (1989)

(38) ICI; Hydroxyethyl methacrylate - Toxicological properties; Imperial Chemical Industries Limited Industrial Hygiene Research Laboratories; unpublished report, report No. TR/555 (25.10.1966)

(39) Imai Y., Watanabe M., Lee H.E., Kojima K., Kadoma Y.; Cytotoxicity of Monomers Used in Dental Resin; Iyo Kizai Kenkyusho Hokoku (Tokyo Ika Shika Daigaku) 22: 87 - 90 (1988)

(40) Internationale MAK- und TLV-Werte 1993/94; Band I: Land, Stoffname; Hersg.: Bayer AG, Abt.: WV Umweltschutz Produktsicherheit (3/1993)

(41) Jacobs M.-C., Rycroft: Allergic contact dermatitis from cyanoacrylate?; short communication, Contact Dermatitis 33: 71 (1995)

(42) Jolanki R., Kanerva L., Estlander T., Tarvainen K.: Concomitant sensitization to triglycidyl isocyanyate, diaminodiphenylmethane and 2-hydroxyethyl methacrylate from silk-screen printing coatings in the manufacture of circuit boards; Contact Dermatitis 3: 13 - 15 (1994)

(43) Kanerva L., Estlander T., Jolanki R., Pekkarinen E.: Occupational pharyngitis associated with allergic patch test reactions from acrylics; Allergy 47: 571 - 573 (1992)

(44) Kanerva L., Estlander T., Jolanki R., Tarvainen K.; Berufsdermatologie: Kontaktekzeme in verschiedenen Berufszweigen; Allergologie 15(9): 322 (1992)

(45) Kanerva L., Estlander T., Jolanki R., Tarvainen K.; Occupational acrylate allergy in dental personnel; Allergologie 15(9): 322 (1992)

(46) Kanerva L., Estlander T., Jolanki R., Tarvainen K.; Occupational allergic contact dermatitis caused by exposure to acrylates during work with dental prostheses; Contact Dermatitis 28: 268-275 (1993)

(47) Kanerva L., Estlander T., Jolanki R.: Double active sensitization caused by acrylics; American Journal of Contact Dermatitis 3(1): 23 - 26 (1992)

(48) Kanerva L., Estlander T., Jolanki R.; Allergic contact dermatitis from dental composite resins due to aromatic epoxy acrylates and aliphatic acrylates; Contact Dermatitis 20: 201-211 (1989)

(49) Kanerva L., Estlander T., Jolanki R.; Sensitization to patch test acrylates; Contact Dermatitis 18: 10-15 (1988)

(50) Kanerva L., Jolanki R., Leino T., Estlander T.; Occupational allergic contact dermatitis from 2-hydroxyethyl methacrylate and ethylene glycol dimethacrylate in a modified acrylic structural adhesive; Contact Dermatitis 33: 84 - 89 (1995)

(51) Kanerva L., Turjanmaa K., Estlander T., Jolanki R.; Occupational Allergic Contact Dermatitis Caused by 2-Hydroxyethyl Methacrylate (2-HEMA) in a New Dentin Adhesive; American Journal of Contact Dermatitis 2(1): 24-30 (1991)

(52) Kanerva L., Turjanmaa K., Jolanki R., Estlander T.; Occupational allergic contact dermatitis from iatrogenic sensitization by a new acrylate dentin adhesive; European Journal of Dermatology 1: 25 - 28 (1991)

(53) Katsuno K., Manabe A., Itoh K., Hisamitsu H., Wakumoto S., Nakayama S., Yoshida T.; A delayed hypersensitivity reaction to dentin primer in the guinea pig; J. Dent. 23(5): 295 - 299 (1995)

(54) Kiec-Swierczynska M.: Occupational allergic contact dermatitis due to acrylates in Lodz; Contact Dermatitis 34: 419 - 422 (1996)

(55) Kiec-Swierczynska M.: Occupational allergy to acrylates; Medycyna Pracy 45(4): 297 - 302 (1994)

(56) Kirk-Othmer; Encyclopedia of Chemical technology, 3 rd ed.; New York, NY: John Wiley and Sons 15: 347-369, 386-371 (1978-1984)

(57) Kirk-Othmer; Encyclopedia of Chemical technology, 3 rd ed.; New York, NY: John Wiley and Sons 15: 347-369, 386-371 (1978-1984); ISBN: 0-471-02068-0

(58) Lawrence W.H., Bass G.E., Purcell W.P., Autian J.; Use of Mathematical Models in the Study of Structure-Toxicity Relationship of Dental Compounds: I. Esters of Acrylic and Methacrylic Acids; J. Dental. Res. 51(2): 526-535 (1972)

(59) Lewis R.J.: Sax's Dangerous Properties of Industrial Materials, 8 ed., Van Nostrand Reinhold, Vol. II: 1607 (1992); ISBN: 0-442-01277-2

(60) Leyhausen G., Heil J., Reifferscheid G., Geurtsen W.: Das genotoxische Potential von Kompositbestandteilen; Dtsch. Zahnäztl. Z. 50: 134 - 136 (1995)

(61) Lovell C.R., Rycroft R.J.G., Williams D.M.J., Hamlin J.W.; Contact dermatitis from the irritancy (immediate and delayed) and allergenicity of hydroxypropyl acrylate; Contact Dermatitis 12: 117-118 (1985)

(62) Lyman W.J., Reehl W.F., Rosenblatt D.H.; Handbook of chemical property estimation methods; Environmental behavior of organic compounds; McGraw-Hill, New York, NY, 2-29, 5.1-5.30 (1982)

(63) MacFarlaine A.W., Curley R.K., King C.M.; Contact sensitivity to unsaturated polyester resin in a limb prosthesis; Contact Dermatitis 15: 301-303 (1986)

(64) Mackay D., Paterson S., Shiu W.Y.; Generic models for evaluating the regional fate of chemicals; Chemosphere 24(6): 695-717 (1992)

(65) Maile W., Lindl T., Weiss D.G.; New methods for cytotoxicity testing: Quantitative video microscopy of intracellular motion and mitochondria-specific fluorescence; Molecular Toxicology 1: 427-437 (1987)

(66) MAK- und BAT-Werte-Liste 1993; Deutsche Forschungs-gemeinschaft, Senatskommission zur Pruefung gesund-heitsschaedlicher Arbeitsstoffe Mitteilung 29, VCH, ISBN: 3-527-27561-4

(67) Malten K.E., Bende W.J.M.; 2-Hydroxy-ethyl-methacrylate and di- and tetraethylene glycol dimethacrylate: Contact sensitizers in a photoprepolymer printing plate procedure; Contact Dermatitis 5: 214-220 (1979)

(68) Manabe A., Hasegawa T., Chigira H., Itoh K., Wakumoto S., Nakayama S., Tachikawa T.; Morphological Changes of Rabbit Skin by Application of Dentin Primer; Dent. Mater. J. 9(2): 147-152 (1990)

(69) Marcus R. et al.; Acute Systemic Toxicological Tests of Soft Contact Lens Extractives; Am. J. Optom. Physiol. Opt. 57(6): 360-362 (1980)

(70) Marren P., De Berker D., Powell S.; Methacrylate sensitivity and transcutaneous electrical nerve stimulation (TENS); Contact Dermatitis 25: 190 - 191 (1991)

(71) Marren P., De Berkker D., Powell S.; Methacrylate sensitivity and transcutanous electrical nerve stimulation (TENS); Contact Dermatitis 25: 190-191 (1991)

(72) Material Safety Data Sheet, Mitsubishi Rayon Co., Ltd. 1999

(73) Mathias C.G.T., Cadwell T.M., Maibach H.I.; Contact dermatitis and gastrointestinal symptoms from hydroxyethylmethacrylat; Britisch Journal of Dermatology 100: 447-449 (1979)

(74) Ministry of Health and Welfare: Japan (1997), Toxicity Testing Reports of Environmental Chemicals 5, 525-552

(75) Mir G.N., Lawrence W.H., Autian J.; Toxicological and Pharmacological Actions of Methacrylate Monomers I: Effects on Isolated, Perfused Rabbit Heart; Journal Pharmaceutical Sciences 62: 778-782 (1973)

(76) Mir G.N., Lawrence W.H., Autian J.; Toxicological and Pharmacological Actions of Methacrylate Monomers III: Effects on Respiratory and Cardiovascular Functions of Anestized Dogs; Journal Pharmaceutical Sciences 63: 376-381 (1974)

(77) Mir G.W., Lawrence W.H., Autian J.; Toxicological and Pharmacological Actions of Methylmethacrylate Monomers II: Effects on isolated guinea pig ileum; Journal of Pharmaceutical Sciences 62: 1258-1261 (1973)

(78) Mitsubishi Rayon Co., Ltd. (2001), Unpublished report on micronucleus test.

(79) Montheard J.P., Chatzopoulos M., Chappard D.; 2-Hydroxyethyl methacrylate (HEMA): Chemical properties and application in biomedical fields; J. Macromol. Sci. Rev. Maromol. Chem. Phys. C32(1): 1-34 (1992)

(80) Munksgaard E.C.; Permeability of protective gloves to di(meth)acrylates in resinous dental materials; Scandinavian Journal of Dental Research 100: 189 - 192 (1992)

(81) Parker D., Turk J.L.; Contact sensitvity to acrylate compounds in guinea pigs; Contact Dermatitis 9: 55-60 (1983)

(82) Paulet G., Vidal M.; De la toxicite de quelque esters acrylices et methacryliques de l'acrylamide et des polyacrylamides; Archieves des Maladies Professionelles de Medecine du Travial et de Securite Sociale 36(1-2): 58-60 (1975)

(83) Pedersen N.B., Senning A., Nielsen A.O.; Different sensitising acrylic monomers in Napp printing plate; Contact Dermatitis 9: 459-464 (1983)

(84) Peiler D., Rustemeyer Th., Frosch P.J.; Dermatosen bei Zahntechnikern - Irritatien und Allergene; Allergologie 19: 93 - 94 (1996)

(85) Peters K., Andersen K.E.; Allergic hand dermatitis from 2-hydroxyethyl-acrylate in contact lenses; Contact Dermatitis 15: 188-189 (1986)

(86) Product information sheet, Mitsubishi Rayon Co., LTD.; Methacrylic Monomers; Specifications and handling (1988)

(87) Purdy P., White C.L. III, Batjer H., Brewer K., Hodges K., Samson D.; Intracarotid hydroxyethylmethacrylate solution causing stroke in dogs; J. Neurosurg 73: 756-756 (1990)

(88) Ranchoff R.E., Taylor J.S.; Contact dermatitis to anaerobic sealants; J. Am. Acad. Dermatol. 13: 1015-1020 (1985)

(89) Rao K.S., Betso J.E., Olson K.J.; A collection of guinea pig sensitization test results--Grouped by chemical class; Drug and Chemical Toxicology 4(4): 331-351 (1981)

(90) Rekker R.F.; The Hydrophobic Fragmental Constant; Elsevier Scientific Publishing Co., New York (1977); ISBN: 0-444-41548-3

(91) Rhône-Poulenc Inc.: Initial Submission: DOT Skin corrosion of SIPOMER HEM-HP-T in rabbits with cover letter dated 061992; Microfiche No.: OTS0541037; Prod. Safety Labs., date produced 07/09/80

(92) Richter G., Geier J.: Dentalwerkstoffe - Problemsubstanzen in der allergologischen Diagnostik ?; Hautarzt 47: 839 - 843 (1996)

(93) Roehm GmbH personal communication

(94) Roehm GmbH, Material Safety Data Sheet (91/155/EEC) (1993)

(95) Roehm GmbH, unpublished report No. 88-025 (1988)

(96) Roehm GmbH, unpublished report No. 88-031 (1988)

(97) Roehm GmbH, unpublished report No. 88-035 (1988)

(98) Roehm GmbH, unpublished report No. 92-055 (1992)

(99) Roehm GmbH, unpublished report No. 93-007 (1993)

(100) Roehm GmbH, unpublished report No.: 93-007 (1993)

(101) Rohm & Haas: Initial Submission: Acute Range-Finding rabbit eye/ skin irritation studies (final report) with cover letter dated 072192; Microfiche No.: OTS0544769; Rohm & Haas Co., date produced 07/22/81

(102) Romaguera C., Vilaplana J., Grimalt F., Ferrando J.: Contact sensitivity to meth(acrylates) in a limb prosthesis; Contact Dermatitis 21: 125 (1989)

(103) Romaguera C., Vilaplana J., Grimalt F., Ferrando J.; Contact Sensitivity to Met(Acrylates) in a Limb Prosthesis; American Journal of Contact Dermatitis 1(3): 183-185 (1990)

(104) Romaguera C., Vilaplana J., Grimalt F., Ferrando J.; Contact Sensitivity to Meth(acrylates) in a Limb Prosthesis; American Journal of Contact Dermatitis 1(3): 183-185 (1990)

(105) RTECS; Registry of Toxic Effects of Chemical Substances; NIOSH, update 96-04, Methacrylic acid, 2-hydroxyethyl ester

(106) Russom C.L., Drummond R.A., Hoffmann A.D.; Acute Toxicity and Behavioral Effects of Acrylates and Methacrylates to Juvenile Fathead Minnows; Bull. Envir. Contam. Toxicol. 41: 589-596 (1988)

(107) Rustemeyer T., Frosch P.J.: Occupational skin diseases in dental laboratory technicans; Contact Dermatitis 34: 125 - 133 (1996)

(108) Röhm GmbH, Material Safety Data Sheet (91/155/EEC) 2-Hydroxyethyl methacrylate (28.05.1996)

(109) Röhm GmbH, personal communication

(110) Röhm GmbH: Untersuchung der Hydrolyseeigenschaften verschiedener Acryl- und Methacrylsäureester bei unterschiedlichen pH-Werten; Luley H. Diplomarbeit, Fachhochschule Darmstadt, Fachbereich Chemische Technologie, unpublished study: 1 - 93 (1995)

(111) Röhm GmbH: Zytotoxizitätsprüfung in vitro: XTT Test mit Ethylenglykoldimethacrylat, Methacrylsäuremethylester, 3-Dimethylaminopropylmethacrylamid, Polyethylenglykol-400-dimethacrylat, 2-Hydroxyethylmethacrylat; CCR Cytotest Cell Research GmbH & Co. KG (1996)

(112) Röhm GmbH; 2-Hydroxyethylmethacrylat (HEMA) Delayed Contact Hypersensitivity modified by E.V. Buehler; IBR, unpublished report No. 82-006 (1982)

(113) Röhm GmbH; Akute Toxizitätsprüfung von "2-Hydroxyäthyl-methacrylat" nach oraler Applikation an der Ratte; IBR, unpublished report No. 78-002 (1978)

(114) Röhm GmbH; Arbeitsplatzmessung im Betrieb 103, Bericht Nr. XIII (20.12.1996)

(115) Röhm GmbH; Arbeitsplatzmessungen Hydroxyester Validierung der Meßmethode; Methodenentwicklung Analytik Meßverfahren zur Bestimmung von Hydroxyestern in der Luft, Bericht 97/3 (1997)

(116) Röhm GmbH; Examination of 2-Hydroxyethyl methacrylate; Institut Fresenius, unpublished report No. 88-025 (1988)

(117) Röhm GmbH; Examination of 2-Hydroxyethyl methacrylate; Institut Fresenius, unpublished report No. 88-031 (1988)

(118) Röhm GmbH; Examination of 2-Hydroxyethyl methacrylate; Institut Fresenius, unpublished report No. 88-035 (1988)

(119) Röhm GmbH; Nachweis der Toxizität im Leuchtbakterientest; Hygiene-Institut Berlin, unpublished report No. 92-055 (1992)

(120) Röhm GmbH; Produktuntersuchungen zur Thematik umweltfreundlicher Injektionsmittel und -verfahren zur Behebung örtlich begrenzter Schäden und Undichtigkeiten in Kanalisationen unter Berücksichtigung des Gewässerschutzes; Hygiene-Institut des Ruhrgebiets, Gelsenkirchen, unpublished report No. 93-007 (1993)

(121) Röhm GmbH; Prüfung von "2-Hydroxyäthylmethacrylat" auf primäre Hautreizwirkung beim Kaninchen; IBR, unpublished report No. 77-009 (1977)

(122) Röhm GmbH; Prüfung von "2-Hydroxyäthylmethacrylat" im Augenreiztest am Kaninchen; IBR, unpublished report No. 78-003 (1978)

(123) Sax N.I., Lewis R.J.; Hawley's Condensed Chemical Dictionary, 11th ed., New York, Van Nostrand Reinhold Co.: 622 (1987)

(124) Schafer E.W.Jr., Bowles W.A.Jr., Hurlbut J.; The acute Oral Toxicity, Repellency, and Hazard Potential of 998 Chemicals to One or More Species of Wild and Domestic Birds; Arch. Environ. Contam. Toxicol. 12(3): 355-382 (1983)

(125) Schnuch A., Geier J.; Kontaktallergie be Dentalberufen; Dermatosen 42(6): 253 - 255 (1994)

(126) Schnuch A.: Allergien gegen Hydroxyethylmethacrylat, Hydroxypropylmethgacrylat, Hydroxyethylacrylat und Hydroxypropylacrylat; personnel communication to Dr. Müllerschön and Dipl.-Ing. G. Ritz, Röhm GmbH; Informationsverband Dermatologischer Kliniken, Göttingen (1997)

(127) Schwach G.W., Hofer H.; Determination of the oral acute toxicity of methacrylates and vinylpyrrolidone in mouse; Ber. Oesterr. Studienges. Atomenerg., SGAE Ber. No. 3004; [German; Chem. Abstr. 90; CA:133656y] (1978)

(128) Schweikl H., Schmalz G., Bey B.; Mutagenicity of dentin bonding agents; Journal of Biomedical Materials Research Vol. 28: 1061 - 1067 (1994)

(129) Stol M., Cifkova I., Brynda E.; Irritation effects of residual products derived from poly(2-hydroxyethyl methacrylate) gels; Biomaterials 9(3): 273-276 (1988)

(130) SZW; De Nationale MAC-lijst 1995; P 145, De Haag (1995); ISBN 90-399-0819-2

(131) Tanii H., Hashimoto K.; Structure-Toxicity Relationship of Acrylates and Methacrylates; Toxicol. Lett. 11: 125-129 (1982)

(132) The Sigma-Ardrich Library of Regulatory and Safety Data

(133) Tosti A., Guerra L., Vincenzi C., Peluso A.M.; Occupational skin hazards from synthetic plastics; Toxicology and Industrial Health 9(3): 493 - 502 (1993)

(134) Ullmann; Ullmanns Encyclopaedie der technischen Chemie; Methacrylsaeure und Methacrylate; Band 16, Verlag Chemie, Weinheim: 609-614 (1978)

(135) Van der Walle H.B., Bensink T.; Cross reaction pattern of 26 acrylic monomers on guinea pig skin; Contact Dermatitis 8: 376-382 (1982)

(136) Van der Walle H.B., Klecak G., Bensink T.; Sensitizing potential of 14 mono (meth) acrylates in the guinea pig; Contact Dermatitis 8: 223 - 235 (1982)

(137) Van Esch C.; UV curing-now and in the future; European Supplement to Polymers Paint Colour Journal 5: 79-85 (1983)

(138) Von Blomberg-Van Der Flier M., Scheper R.J., Boerrigter G.H., Polak L.; Induction of Contact Sensitivity to a Broad Variety of Allergens with Haptenized Macrophages; Journal of Investigative Dermatology 83(2): 91-95 (1984)

(139) Vyshemirskaya L.D., Doloshitskii S.L., Romaniv R.V.; Investigation of thresholds and delayed effects of ethylene glcol monomethacrylate; Gig. Sanit. 11: 81 - 82 (russian), german translation available (1987)

(140) Waegemaekers T.H.J.M., Bensink M.P.M.; Non-mutagenicity of 27 aliphatic acrylate esters in the Salmonella-microsome test; Mut. Res. 137: 95-102 (1984)

(141) Wahlberg J.E.; Contact sensitivity to NAPP printing plates secondary to a relapsing hand dermatitis; Contact Dermatitis 9(3): 239 (1983)

(142) Watanabe A., Nakabayashi N.: Cytotoxicity of MMA and HEMA. Phase-contrast microscopy, SEM, and TEM observation; Iyo Kizai Kenkyusho Hokoku 28: 33 - 39 (1994)