



**German Chemical Society
Gesellschaft Deutscher Chemiker**

GDCh-Advisory Committee
on Existing Chemicals of
Environmental Relevance (BUA)

BUA Reports 150 and 151

Methyl chloroacetate

BUA Report 150
(April 1994)

Ethyl chloroacetate

BUA Report 151
(December 1993)



S. Hirzel

Wissenschaftliche Verlagsgesellschaft 1996

GDCh-Advisory Committee on Existing Chemicals of Environmental Relevance (BUA)

Chairman:

Prof. Dr. E. Bayer, Institut für Organische Chemie der Universität Tübingen

Members:

Dr. G. Alfke, Mineralölwirtschaftsverband e. V., Hamburg

Prof. Dr. K. Ballschmiter, Abteilung Analytische Chemie und Umweltchemie der Universität Ulm

Dr. R. Bias, BASF AG, Emissionsüberwachung und Ökologie, Ludwigshafen a. Rh.

Dr. B. Broecker †, HOECHST AG, Abteilung Umweltchemikalien/Verbrauchersicherheit, Frankfurt am Main

Prof. Dr. O. Fränzle, Geographisches Institut der Universität Kiel

Prof. Dr. F. H. Frimmel, DVGW-Forschungsstelle am Engler-Bunte-Institut der Universität Karlsruhe

Prof. Dr. H.-P. Gelbke, BASF AG, Toxikologie, Ludwigshafen a. Rh.

Prof. Dr. H. Greim, GSF — Institut für Toxikologie, Neuherberg (Vice Chairman)

Dir. und Prof. Dr. J. Hahn, Institut für Wasser-, Boden- und Lufthygiene des Umweltbundesamtes, Berlin

Dr. H. Jungen, Deutsche Wissenschaftliche Gesellschaft für Erdöl, Erdgas und Kohle e. V., Hamburg

Dir. und Prof. Dr. D. Kayser, Bundesinstitut für gesundheitlichen Verbraucherschutz und Veterinärmedizin, Berlin

Dr. W. Mühlhölzl, Bayerische Landesanstalt für Wasserforschung, München

Prof. Dr. P. Müller, Institut für Biogeographie, Universität des Saarlandes, Saarbrücken

Dir. und Prof. Dr. E. Offhaus, Umweltbundesamt, Berlin

Dr. R. Ott, Deutsche Shell Chemie GmbH, Eschborn/Ts.

MinRat Prof. Dr. U. Schlottmann, Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, Bonn

Dr. N. Schön, BAYER AG, Umweltschutz/Produktsicherheit, Leverkusen

Vizepräsident Dr. A. Troge, Umweltbundesamt, Berlin

Collaborators and Guests:

Dr. K. H. Adlfinger, Initiative Umweltrelevante Altstoffe, Frankfurt am Main

Priv.-Doz. Dr. J. Ahlers, Fachgebiet IV 1.2 des Umweltbundesamtes, Berlin

Dr. S. Ettel, Institut für Organische Chemie der Universität Tübingen

Dr. J. Feltes, Fraunhofer-Institut für Toxikologie und Aerosolforschung, Hannover

Dr. R. F. Hertel, Fachgruppe 821 des Bundesinstituts für gesundheitlichen Verbraucherschutz und Veterinärmedizin, Berlin

Dr. H. Kluge, HOECHST AG, Frankfurt am Main

Dr. J. Koppenhöfer, Institut für Organische Chemie der Universität Tübingen

Prof. Dr. R. Kümmel, Institut für Umwelt- und Sicherheitstechnik der Fraunhofer Management-Gesellschaft, Oberhausen

Frau Dr. I. Mangelsdorf, GSF - Institut für Toxikologie, Neuherberg

Dr. J. Oberhansberg, BG Chemie, Heidelberg

Frau Dr. U. Reuter, GSF — Institut für Toxikologie, Neuherberg

Dr. G. Rosner, Fraunhofer-Institut für Toxikologie und Aerosolforschung, Hannover

Dr. W. Söchtig, Fraunhofer-Institut für Toxikologie und Aerosolforschung, Hannover

Frau Dr. H. Sterzl-Eckert, GSF - Institut für Toxikologie, Neuherberg

Dr. D. Vogel, Institut für Organische Chemie der Universität Tübingen

Frau Dipl.-Biol. L. Weis, Institut für Organische Chemie der Universität Tübingen

Frau Dr. K. Widmann, Institut für Organische Chemie der Universität Tübingen

GDCh Office:

Dr. H. Behret, GDCh, Frankfurt am Main

BUA Reports 150 and 151

Methyl chloroacetate

BUA Report 150

(April 1994)

Ethyl chloroacetate

BUA Report 151

(December 1993)

edited by the GDCh-Advisory
Committee on Existing Chemicals
of Environmental Relevance

Beratergremium für
Umweltrelevante Altstoffe (BUA)



S. Hirzel

Wissenschaftliche Verlagsgesellschaft 1996

Dr. H. Behret
Gesellschaft Deutscher Chemiker
Postfach 90 04 40
D-60444 Frankfurt am Main

This book was carefully produced. Nevertheless, authors, editors and publisher do not warrant the information contained therein to be free of errors. Readers are advised to keep in mind that statements, data, illustrations, procedural details or other items may inadvertently be inaccurate.

The use of general descriptive names, trade names, trademarks, etc. in a publication, even if not specifically identified, does not imply that these names are not protected by the relevant law and regulations.

Die Deutsche Bibliothek — CIP-Einheitsaufnahme

Methyl chloroacetate : (April 1994). Ethyl chloroacetate :
(December 1993). Ed. by the GDCh Advisory Committee on
Existing Chemicals of Environmental Relevance. – Stuttgart:
Hirzel ; Stuttgart : Wiss. Verl.-Ges., 1996
(BUA report; 150/151)

Dt. Ausg. u.d.T.: Chloressigsäuremethylester
ISBN 3-7776-0725-8

NE: Ethylchloroacetate; Gesellschaft Deutscher Chemiker /
Beratergremium für Umweltrelevante Altstoffe: BUA report

All rights reserved. No part of this publication may be translated, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, microfilming, recording or otherwise, without permission in writing from the publisher.

© 1996 S. Hirzel Verlag, Birkenwaldstraße 44, 70191 Stuttgart

Printed in acid-free and low-chlorine paper.

Printing and binding: Druckhaus Beltz, Hemsbach
Printed in F.R. Germany

Foreword

The German Chemicals Act (Chemikaliengesetz - ChemG) of 1980 stipulates that certain existing chemicals must be reported to the competent authority, if they exhibit properties which indicate that they may be hazardous, either alone or in combination with other substances.

In the summer of 1982, an Advisory Committee on Existing Chemicals of Environmental Relevance (BUA) was set up by the German Chemical Society (Gesellschaft Deutscher Chemiker - GDCh). It brings together representatives from the scientific community, the chemical industry and the governmental authorities. This Advisory Committee is responsible for elaborating appropriate solutions for substances of relevance for health and the environment on the basis of voluntary measures. It selects and examines existing chemicals from the aforementioned angles. The testing and evaluation are based on scientific criteria alone.

It was, therefore, necessary to develop priority setting procedures. In a first phase reports were only prepared for priority chemicals. Within the framework of a first priority setting procedure, chemicals were compiled from several priority lists and 135 chemicals were selected for detailed substance reports.

In a second priority setting procedure the survey of the German Chemical Industry Association (VCI) on all substances with a production volume of more than 10 tons per year was used as a starting list. Since this survey covered 4,600 chemicals, BUA decided to process the corresponding list in several stages. The first stage included approx. 1,050 substances with a production volume of more than 1,000 tons per year.

Detailed reports are drawn up on chemicals suspected of having a hazard potential and abridged reports on those presenting only a minor hazard potential, according to the current state of knowledge.

The detailed BUA reports take in both the published literature and data from industry. If data for the evaluation of the chemicals are not available, additional studies are recommended and the results are published as updates to the reports. The reports serve as a basis for the instigation of administrative measures, when there are indications of risks to health or the environment.

Tübingen, May 1993

Ernst Bayer
Chairman of the Advisory Committee
on Existing Chemicals
of Environmental Relevance

Methyl chloroacetate

BUA Report 150

(April 1994)

edited by the GDCh-Advisory
Committee on Existing Chemicals
of Environmental Relevance

Contents

Summary and Conclusions	XI
Recommendations	XV
1. Chemistry of methyl chloroacetate	1
1.1 Chemical Identity	1
1.2 Composition of the technical product	2
1.3 Chemical Properties	2
2. Physical Properties	4
3. Analysis	6
3.1 Determination in Air	7
3.2 Determination in Water	7
3.3 Determination in Soil, Sediment and Biological Material	9
4. Discharge into the environment during production, processing, application and waste disposal	10
4.1 Production methods	10
4.2 Producers and processors, production quantities, export, import, total consumption	11
4.3 Processing, application, quantities used	12
4.3.1 Processing	12
4.3.2 Application	14
4.4 Discharge into the atmosphere	14
4.4.1 Discharge during production and processing	14
4.4.2 Discharge during application	15
4.5 Discharge into the hydrosphere	15
4.5.1 Discharge during production and processing	15
4.5.2 Discharge during application	16
4.5.3 Discharge from other areas	16
4.6 Discharge into the geosphere and biosphere	17
4.7 Discharge from waste materials and their treatment	17
4.8 Balance of sources of discharge into the environment	18
5. Occurrence in the environment	19
5.1 Atmosphere	19
5.2 Hydrosphere	19
5.3 Geosphere	19
5.4 Biosphere	19
5.5 Natural sources	19
6. Behaviour in the environment	20
6.1 Transformation, degradation and degradation products	20
6.1.1 Biological degradation	20
6.1.2 Hydrolytic degradation	21
6.1.3 Photochemical decomposition	22
6.1.3.1 Photochemical decomposition in the air	22
6.1.3.2 Photochemical decomposition in water	23

6.2	Accumulation	23
6.2.1	Bioaccumulation	23
6.2.2	Geoaccumulation	23
6.3	Distribution behaviour and transport processes in and between the environmental compartments	24
6.3.1	Henry constant	24
6.3.2	n-Octanol/water partition coefficient	24
6.3.3	Soil sorption coefficients	25
6.4	Residues in the environment	25
7.	Ecotoxicology	27
7.1	Effect on aquatic organisms	27
7.1.1	Microorganisms	27
7.1.2	Plants	27
7.1.3	Invertebrates	27
7.1.4	Vertebrates	28
7.2	Effect on terrestrial organisms	29
7.2.1	Microorganisms	29
7.2.2	Plants	29
7.2.3	Invertebrates	29
7.2.4	Vertebrates	30
7.3	Effects on ecosystems	30
8.	Toxicity in warm-blooded animals	31
9.	Substance-specific regulations	32
9.1	Regulations for Dangerous Materials	32
9.2	Technical Instructions for Air Pollution Abatement (TA-Luft)	32
9.3	Water Resources Law	33
9.4	Regulations for Combustible Liquids	33
9.5	Transport regulations	33
9.6	Technical Instructions for Disposal of Waste Material (TA-Abfall)	34
10.	Summary and conclusions	35
10.1	Ecological aspects	35
10.1.1	Occurrence and distribution among the compartments	35
10.1.2	Degradability	36
10.1.3	Accumulation	37
10.1.4	Ecotoxic effects	37
10.2	Toxicological aspects	38
11.	Recommendations	40
12.	Bibliography	41

Toxicological assessment no. 76 of the BG Chemie (1994) Appendix
(German Employers Liability Insurance Association for the
Chemical Industry)

BUA Report on acid methyl ester

Summary and conclusions

Ecological aspects

Occurrence and distribution in the compartments

In the Federal Republic of Germany, methyl chloroacetate is actually (as of 1990/91) produced in a quantity of 1 000 — 5 000 t/a by esterification of monochloroacetic acid with methanol and partially processed at home, partially exported.

The quantity processed in the Federal Republic of Germany, imports included, is distributed among the consecutive products dimethyl malonate (about 58 %), chloroacetamide and derivatives (about 40 %) and a series of minor use areas (< 1.6 %), e.g. flavours and fragrances.

During the production of methyl chloroacetate, about 300 kg/a are emitted into the atmosphere.

When it is processed to chloroacetamide, no emission is to be expected because the vent air is scrubbed.

The discharge into the hydrosphere from production and processing to chloroacetamide is < 75 kg/a.

The release caused by residual contents in this product can be estimated at < 70 kg/a.

During processing to dimethyl malonate, < 10 kg/a are discharged into the hydrosphere according to routine measurements of AOX, whereas practically nothing is emitted into the atmosphere.

No data are available on the discharges from other areas of use.

XII

The wastes (about 200 and 50 kg/a, respectively) resulting from production and processing to dimethyl malonate are incinerated.

No wastes remain from processing to chloroacetamide other than the charge of the effluent. No data are available on the other areas of use.

There are no data available on occurrence in the environment.

According to the Henry's Law Constant of $1.47 \text{ Pa} \cdot \text{m}^3 \cdot \text{mol}^{-1}$, methyl chloroacetate is moderately volatile from aqueous solution.

Degradability

In a test on potential biodegradability according to OECD 302 B, 98 % of the substance were eliminated within 10 days when measured as COD, whereas only 78 % of the chlorine bound organically were transformed to chloride, i.e. about 20 % of the substance had volatilized on aeration.

The half-life time of hydrolysis of methyl chloroacetate in neutral aqueous solution yielding chloroacetic acid and methanol was derived from calculated reaction enthalpies to be 22 days and was calculated, respectively, on the basis of a measured reaction rate constant to be about 39 days. Yet, hydrolysis is likely to be accelerated also in neutral or weakly acid solution by general base catalysis.

The half-life time of the photochemical-oxidative degradation in the atmosphere was calculated to be 74 days.

Accumulation

No studies are known on bio- and geoaccumulation. With respect to the (calculated) n-octanol-water partition coefficient ($\log P_{OW} = 0.76$), a relevant bioaccumulation potential is not to be expected.

Ecotoxic Effects

A 24 h EC₁₀ of 35 mg/l was determined in *Pseudomonas putida* for the inhibition of cell proliferation.

In facultatively anaerobic bacteria no inhibition of gas production was observed after 24 hours exposure to methyl chloroacetate in concentrations ranging up to 200 mg/l.

The toxic limit concentration (24 h EC₃ for the growth of a green alga is 0.19 mg/l.

There are no studies known regarding the effect on higher plants.

Testing the acute toxicity to the *Daphnia* resulted in a 24 h EC₀ of 3.2 mg/l and a 24 h EC₅₀ of 5.5 mg/l for inhibition of the swimming capability.

The 48 h and 96 h LC₀ in the zebra fish was 1.13 mg/l.

For the rainbow trout, 48 h LC₀ < 2.5 mg/l and 48 h LC₁₀₀ of 6 mg/l are reported.

Toxicological Aspect *)

Chloroacetic acid methyl ester is toxic on acute oral or dermal exposure (LD₅₀ rat oral 107 and 140 mg/kg body weight; rat dermal 136.6 mg/kg and approx. 470 mg/kg body weight; rabbit dermal 318 mg/kg body weight). Both non-specific signs of toxicity and clear irritant effects are observed. Comparable symptoms also occur after intraperitoneal injection (LD₅₀ mouse i.p. 200 to 460 mg/kg body weight) and vapour inhalation. Marked irritation

*) With permission of BG Chemie taken from:
Toxikologische Bewertungen Nr. 76 „Chloressigsäuremethylester“.
Berufsgenossenschaft der chemischen Industrie, Heidelberg (1994).
Kapitel 1: Summary and assessment

XIV

of the respiratory tract and eyes is also observed on inhalation exposure (LC_{50} rat $> 945 < 1\,418$ mg/m³).

After repeated inhalation exposure to chloroacetic acid methyl ester for 28 days at concentrations of 10, 33 or 100 ppm (equivalent to 44, 146 and 443 mg/m³, respectively), adverse effects on the breathing (irregular breathing) and on movement (uncoordinated gait) as well as irritant effects (closing together of the eyelids, sneezing, increased frequency of cleaning) and an increase in relative lung weight occurred in rats at the highest concentration. These effects, though less pronounced, were also observed in males in the 33 ppm group. In contrast, no such effects were detected in the 10 ppm group. Body weight gain was markedly impaired in both sexes at the highest concentration. Thus in this study, the no effect level is 10 ppm in male rats and 33 ppm in female rats.

Chloroacetic acid methyl ester is corrosive to rabbit skin and is absorbed through the skin (0.5 ml undiluted substance/rabbit leads to death). The substance is severely irritating to the rabbit eye.

In guinea-pigs, chloroacetic acid methyl ester induces sensitization. Cross— sensitization with chloroacetic acid ethyl ester has been observed in this species.

Chloroacetic acid methyl ester is not mutagenic in the Salmonella/microsome test in five strains of *Salmonella typhimurium* or in *Escherichia coli* either with or without metabolic activation. No induction of micronuclei has been observed in the micronucleus test in the mouse.

No increase in the incidence of lung tumours has been established after intraperitoneal administration to strain A mice.

In man, delayed occurrence of irritation of the conjunctiva is observed after exposure to the vapour.

Recommendations

Ecology

In order to clarify the ecological relevance, tests on biodegradability (test on ready biodegradability) are to be carried out.

Toxicology

Data are lacking especially on prolonged toxicity and reproductive toxicity.

On the basis of the use pattern the emissions into the environment seem to be small. From the view of BUA clarification of the open questions on toxicology may be deferred if the minor environmental exposure is confirmed by the test on biodegradability.

Ethyl chloroacetate

BUA Report 151

(December 1993)

edited by the GDCh-Advisory
Committee on Existing Chemicals
of Environmental Relevance

Contents

Summary and Conclusions	V
Recommendations	X
1. Chemistry of ethyl chloroacetate	1
1.1 Chemical identity	1
1.2 Composition of the technical product	2
1.3 Chemical properties	2
2. Physical properties	3
3. Analysis	5
3.1 Determination in air	6
3.2 Determination in water	6
3.3 Determination in soil, sediment and biological material	8
4. Discharge into the environment during production, processing, application and waste disposal	9
4.1 Production processes (by-products, impurities)	9
4.2 Producers and processors, production quantities, export, import, total consumption	10
4.3 Processing, application, quantities used	11
4.3.1 Processing	11
4.3.2 Application	12
4.4 Discharge into the atmosphere	13
4.4.1 Discharge during production and processing	13
4.4.2 Discharge during application	13
4.5 Discharge into the hydrosphere	14
4.5.1 Discharge during production and processing	14
4.5.2 Discharge during application	15
4.5.3 Discharge from other areas	15
4.6 Discharge into the geosphere and biosphere	16
4.7 Discharge from waste materials and their treatment	16
4.8 Balance of sources of discharge into the environment	17
5. Occurrence in the environment	18
5.1 Atmosphere	18
5.2 Hydrosphere	18
5.3 Geosphere	18
5.4 Biosphere	18
5.5 Natural sources	18
6. Behaviour in the environment	19
6.1 Transformation, degradation and degradation products	19
6.1.1 Biological degradation	19
6.1.2 Hydrolytic degradation	20
6.1.3 Photochemical decomposition	21
6.1.3.1 Photochemical decomposition in the air	21
6.1.3.2 Photochemical decomposition in water	22

6.2	Accumulation	22
6.2.1	Bioaccumulation.....	22
6.2.2	Geoaccumulation	22
6.3	Distribution behaviour and transport processes in and between the environmental compartments	23
6.3.1	Henry constant	23
6.3.2	n-octanol/water partition coefficient	24
6.3.3	Soil sorption coefficients	24
6.4	Residues in the environment	24
7.	Ecotoxicity	26
7.1	Effects on aquatic organisms	26
7.1.1	Microorganisms	26
7.1.2	Plants	26
7.1.3	Invertebrates	26
7.1.4	Vertebrates	27
7.2	Effect on terrestrial organisms	27
7.2.1	Microorganisms	27
7.2.2	Plants	28
7.2.3	Invertebrates	29
7.2.4	Vertebrates	29
7.3	Effects on ecosystems	29
8.	Toxicity in warm-blooded animals	30
9.	Substance-specific regulations	31
9.1	Regulations for Dangerous Materials	31
9.2	Technical Instructions for Air Pollution Abatement (TA-Luft)	31
9.3	Water Resources Law	32
9.4	Regulations for Combustible Liquids	32
9.5	Transport regulations	32
9.6	Technical Instructions for Disposal of Waste Material (TA-Abfall)	33
10.	Summary and conclusions	34
10.1	Ecological aspects	34
10.1.1	Occurrence and distribution among the compartments	34
10.1.2	Degradability	35
10.1.3	Accumulation	36
10.1.4	Ecotoxic effects	36
10.2	Toxicological aspects	37
11.	Recommendations	38
12.	Bibliography	39

Toxicological Assessment no. 190 of the BG Chemie (1992). Appendix
(German Employers Liability Insurance Association for the Chemical Industry)

BUA Report on Chloroacetic acid ethyl ester

Summary and conclusions

Ecological aspects

Occurrence and distribution among the compartments

In the Federal Republic of Germany, ethyl chloroacetate is actually (as of 1990/91) produced in a quantity of 1000—5000 t/a by esterification of monochloroacetic acid with ethanol and partially processed at home, partially exported.

88 % of the ethyl chloroacetate processed in the Federal Republic of Germany, which is partially imported, are used for the production of diethyl malonate, approx. 5 % are processed to phosphonoacetic acid triethyl ester for plastics additives, approx. 4 % to the herbicide benazolin-ethyl. The rest of 3 % is distributed among a series of minor use areas, e.g. flavours and fragrances.

During the production of ethyl chloroacetate, 120 kg/a are emitted into the atmosphere and less than 75 kg/a are discharged into the hydrosphere.

Practically nothing of the substance is emitted into the atmosphere when it is processed to diethyl malonate; < 11 kg/a are discharged into the hydrosphere according to routine measurements of AOX and conversion into the ester. The emission into the atmosphere during processing to triethyl phosphonoacetate is negligible, the discharge into the hydrosphere is not quantified. During processing to benazolin-ethyl < 1 kg ethyl chloroacetate/a is emitted into the atmosphere; there is no release into the hydrosphere because the resulting effluent is incinerated.

From the use of benazolin-ethyl, < 150 kg ethyl chloroacetate/a are discharged into the environment.

No data are available on the discharges from other areas of use.

The wastes (approx. 26 t/a) resulting from production and processing are incinerated.

There are no data available on occurrence in the environment.

According to the Henry's Law Constant of $2.85 \text{ Pa} \cdot \text{m}^3 \cdot \text{mol}^{-1}$ ethyl chloroacetate is moderately volatile from aqueous solution.

Degradability

In a test on potential biodegradability according to OECD 302 8, 93 % of the substance were eliminated within 13 days when measured as COD, whereas only 74 % of the chlorine bound organically were transformed to chloride, i.e. about 20 % of the substance had volatilized on aeration.

The half-life time of hydrolysis of ethyl chloroacetate in neutral aqueous solution yielding chloroacetic acid and ethanol was calculated to be 74 days using the reaction rate constants of the base-catalysed hydrolysis at different base concentrations and extrapolating to infinite dilution of the bases.

The half—life time of the photochemical-oxidative degradation in the atmosphere was calculated to be 11.1 days.

Accumulation

No studies are known on bio- and geoaccumulation. With respect to the (calculated) n-octanol-water partition coefficient ($\log P_{ow} = 1.28$), a relevant bioaccumulation potential is not to be expected.

Ecotoxic Effects

In facultatively anaerobic bacteria, no inhibition of gas production was observed after 24 hours exposure to ethyl chloroacetate in concentrations ranging up to 900 mg/l.

There are no studies known on the effect of ethyl chloroacetate to algae. It is supposed to be similar to the homologous methyl chloroacetate. For the latter, a toxic limit concentration (24 h EC₃) of 0.19 mg/l was determined.

Testing the acute toxicity to the Daphnia resulted in a 24 h EC₀ of 1.9 mg/l for inhibition of the swimming capability.

The 48 h and 96 h LC₀ in the zebra fish was 1.0 mg/l.

The shoot fresh weights of different terrestrial plant species amounted to 83 - 125 and 70 - 120 %, respectively, of controls 14 days after 500 and 1000 mg/m² had been sprayed onto the plant substrate.

Toxicological Aspect ^{*)}

Chloroacetic acid ethyl ester is acutely toxic (oral LD₅₀ rat: 180 mg/kg body weight; dermal LD₅₀ rat: 161 mg/kg body weight, rabbit: 230—335 mg/kg body weight; LC₅₀ rat, 4 hours: 3.33 ml/m³ air).

In the rabbit the substance is a moderate skin irritant and a strong eye irritant. Studies conducted in guinea-pigs according to Magnusson/Kligman provide evidence of sensitization (25 % of animals show a positive reaction). ^{**)}

In the Salmonella/microsome test, chloroacetic acid ethyl ester is not genotoxic when tested in *Saccharomyces cerevisiae* and *Escherichia coli*.

^{*)} With permission of BG Chemie taken from:

Toxikologische Bewertung Nr. 190 „Chloressigsäureethylester“.
Berufsgenossenschaft der Chemischen Industrie, Heidelberg (1992).
Kapitel 1: Summary and assessment.

^{**)} Another, unpublished study has become known, in which 79 % of the animals show a positive reaction.

VIII

No tumorigenic effect is detected in two carcinogenicity studies where mice have received chloroacetic acid ethyl ester epicutaneously and subcutaneously. Nor is any evidence of a carcinogenic effect obtained in a further carcinogenesis study in mice (strain A).

In one case, chloroacetic acid ethyl ester has produced contact allergy in a human.

Recommendations

Ecology

In order to clarify the ecological relevance, tests on biodegradability (test on ready biodegradability) are to be carried out.

Toxicology

Data are lacking especially on prolonged toxicity and reproductive toxicity.

On the basis of the use pattern the emissions into the environment seem to be small. From the view of BUA clarification of the open questions on toxicology may be deferred if the minor environmental exposure is confirmed by the test on biodegradability.