LAB Research Ltd.

Address: 8200 Veszprém, Szabadságpuszta

Phone: +36 88 545 300

Fax: +36 88 545 301

FINAL REPORT

READY BIODEGRADABILITY OF ETHYLENE DIBROMIDE INDUSTRIAL (EDB) IN A CLOSED BOTTLE TEST

Date of Final Report: 16 September 2010

STUDY CODE: 10/112-322AN

STATEMENT OF THE STUDY DIRECTOR

This study has been performed in accordance with the study plan agreed upon by the Sponsor, the OECD Guidelines for Testing of Chemicals (No. 301D, July 17, 1992) the EPA Fate, Transport and Transformation Test Guideline (OPPTS 835.3110, January 1998), the EEC Directive 92/69, C.4-E and the Principles of Good Laboratory Practice Regulations as specified by national Hungarian GLP Regulations: 9/2001.(III.30.) EüM-FVM joint decree of the Minister of Health and the Minister of Agriculture and Regional Development which corresponds to the OECD GLP, ENV/MC/CHEM(98)17.

I the undersigned declare that this report constitutes a true record of the actions undertaken and the results obtained in the course of this study. By virtue of my dated signature I accept the responsibility for the validity of the data and the following conclusion drawn from them:

"The test item can be considered to be not ready biodegradable."

Signature:_____ Date: 16 sept. 2010

Krisztina Sipos, M.Sc.
Study Director

STATEMENT OF THE MANAGEMENT

According to the conditions of the research and development agreement between CHEMTURA CORPORATION (as Sponsor) and LAB Research Ltd. (as Testing Facility)] "Ready Biodegradability of Ethylene Dibromide Industrial (EDB) in a Closed Bottle Test" has been performed in compliance with the study plan and the Principles of Good Laboratory Practice.

Signature: _____ Date: 16 Sept 2010

Christopher Banks, DABT
Managing Director

QUALITY ASSURANCE STATEMENT

Study Code: 10/112-322AN

Study Title: Ready Biodegradability of Ethylene Dibromide Industrial (EDB) in a Closed Bottle Test

Test Item: Ethylene Dibromide Industrial (EDB)

This study has been inspected, and this report audited by the Quality Assurance Unit in compliance with the Principles of Good Laboratory Practice. As far as it can be reasonably established the methods described and the results incorporated in this report accurately reflect the raw data produced during this study.

All inspections, data reviews and the report audit were reported in written form to the study director and to management. The dates of such inspections and of the report audit are given below:

Date of Inspection	Phase(s) Inspected/Audited	Date of report to	
		Management	Study Director
22 June 2010	Study Plan	22 June 2010	22 June 2010
29 July 2010	Preparation of Inoculum	29 July 2010	29 July 2010
08 September 2010	Draft Report	08 September 2010	08 September 2010
16 September 2010	Final Report	16 September 2010	16 September 2010

Signature: Fábián Makovi Éva

Éva Makovi-Fábián, B.Sc.
On behalf of QA

Date: 16 September 2010

GENERAL INFORMATION

STUDY TITLE	:	Ready Biodegradability of Ethylene Dibromide Industrial (EDB) in a Closed Bottle Test
TEST ITEM	:	Ethylene Dibromide Industrial (EDB)
MANUFACTURER	:	Chemtura Manufacturing UK Limited Address: Tenax Road, Trafford Park Manchester United Kingdom M17 1WT
SPONSOR	:	CHEMTURA CORPORATION Address: 199, Benson Road, Middlebury, Connecticut 06749 USA
TEST FACILITY	:	LAB Research Ltd. Address: H-8200 Veszprém, Szabadságpuszta Phone: +36 88 545 300 Fax: +36 88 545 301
STUDY DIRECTOR	:	Krisztina Sipos, M.Sc.
QUALITY ASSURANCE		Szabolcs Gáty, M.Sc. Head of QAU
START OF EXPERIMENT	:	29 July 2010
END OF EXPERIMENT	:	26 August 2010
BASIS OF STUDY	:	OECD Guidelines for Testing of Chemicals, No.: 301D, EPA Guideline, OPPTS 835.3110, Council Regulation (EC) No 440/2008, Method C.4-E

CONTENTS

LIST OF TABLES AND FIGURES

1. SUMMARY

The test item Ethylene Dibromide Industrial (EDB) was investigated for its ready biodegradability in a Closed Bottle Test over a period of 28 days. The biodegradation was followed by the oxygen uptake of the microorganisms during exposure. As a reference item Sodium benzoate was tested simultaneously under the same conditions as the test item, and functioned as a procedure control.

The test system was a microbial inoculum of good quality, collected from the sewage plant for domestic sewage. The sludge was washed by centrifugation filtered through cotton wool and aerated until use. Based on the determined dry weight content, the washed sludge suspension contained 4 g dry material per litre.

Under the test conditions the percentage biodegradation of Ethylene Dibromide Industrial (EDB) reached a mean of 4.2 % after 28 days based on the measured COD of the test item.
The test item can therefore be considered to be not ready biodegradable. According to the test guidelines the pass level for ready biodegradability is removal of 60 % ThOD.

The reference item Sodium benzoate was sufficiently degraded to a mean of 75.0 % after 14 days, and to a mean of 79.2 % after 28 days of incubation, based on $ThOD_{NH4}$, thus confirming the suitability of the used activated sludge inoculum.

In the toxicity control containing both, the test item and the reference item Sodium benzoate, a mean of 25.8 % biodegradation was noted within 14 days and 26.3 % biodegradation after 28 days of incubation.

According to the test guidelines **the test item can be assumed to be not inhibitory at the applied concentration level of 15.0 mg/L on the activated sludge microorganisms** because degradation was >25 % within 14 days.

2. OBJECTIVE OF THE STUDY

2.1. PURPOSE

The purpose of this study was to determine the ready biodegradability of the test item Ethylene Dibromide Industrial (EDB). The test item was exposed for 28 days to a dilute suspension of microorganisms derived from a sample of activated sludge taken from the aeration tank of a domestic waste water treatment plant. The biodegradation was followed by the oxygen uptake of the microorganisms during exposure. As a reference item Sodium benzoate was tested simultaneously under the same conditions as the test item, and functioned as a procedure control.

This study is recognised by the test guidelines and should provide a rational basis to assess the ready biodegradation properties of the test item when incubated with activated sludge.

2.2. DEFINITIONS

$ThOD_{NH4}$: Theoretical Oxygen Demand, the total amount of oxygen required to oxidise a chemical completely. It is calculated from the molecular formula, assuming no nitrification occurs, and expressed as mg oxygen required per mg test item.

COD: Chemical Oxygen Demand, the total amount of oxygen required to oxidise a chemical completely. It is measured by established procedures (oxidation, titration and photometric procedure steps).

BOD: Biochemical Oxygen Demand, the amount of oxygen consumed by microorganisms when metabolising a test item; also expressed as mg oxygen uptake per mg test item.

10-day window: the 10 days immediately following the attainment of 10 % biodegradation. The pass level, 60 % of ThOD has to be reached in a 10-day window within the 28-d period of the test.

2.3. CONDITIONS FOR THE VALIDITY OF THE TEST

- Oxygen depletion in the inoculum control did not exceed 1.5 mg O_2/L after 28 days.
- The residual oxygen concentration in the test flasks did not drop below 0.5 mg O_2/L at any time.
- The difference of duplicate values for the degradation at any time during the test was less than 20 %.
- The percentage degradation of the reference item reached the level for ready biodegradability (> 60 %) within 14 days.

3. MATERIALS AND METHODS

3.1. TEST ITEM

Name:	Ethylene Dibromide Industrial (EDB)
Chemical name:	1,2-Dibromoethane
Batch No.:	510100003
Active component:	>99.94 % 1,2-Dibromoethane (CAS 106-93-4)
Description:	clear to amber liquid
Manufacture date:	February 2010
Expiry date:	February 2011
Storage:	room temperature;15-25°C (humidity 50 % ± 20), protect from light
Safety Precautions:	see Safety Data Sheet

3.2. REFERENCE ITEM

Name:	Sodium benzoate
Molecular Formula:	$C_7H_5NaO_2$
Molecular Weight [g/mol]:	144.10
Batch Number:	19127ME
Expiry date:	November 2010
Supplier:	Sigma-Aldrich
Storage condition:	In tightly closed container, under dry conditions at room temperature
Safety precautions:	Routine safety and hygienic procedures

3.3. IDENTIFICATION, RECEIPT

The test item of a suitable chemical purity was supplied by the Sponsor. Precautions required in the handling and disposal of the test item were supplied by the Sponsor. These documents are part of the raw data.

Identification of the test item was performed in the Central Dispensary of LAB Research Ltd. on the basis of its batch number, name, appearance and colour.

3.4. RECONSTITUTED WATER

3.4.1. Stock solutions

In deionised water analytical grade salts were added to prepare the following stock solutions:

a) Solution:	KH_2PO_4	2.125g
	K_2HPO_4	5.4375g
	Na_2HPO_4 x $12H_2O$	16.795g
	NH_4Cl	0.125g
	Deionised water	ad 250 mL
b) Solution:	$MgSO_4$ x 7 H_2O	5.625g
	Deionised water	ad 250 mL
c) Solution:	$CaCl_2$ x 2 H_2O	9.10 g
	Deionised water	ad 250 mL
d) Solution:	$FeCl_3$ x 6 H_2O	0.25 g
	Deionised water	ad 1000 mL

3.4.2. Chemicals Used for Reconstituted Water

Table 1.: Chemicals Used for Reconstituted Water

Chemical	Supplier	Batch Number	Expiry date
$CaCl_2$ x $2H_2O$	REANAL (lach:ner)	PP/2008/10190	31 January 2011
$FeCl_3$ x 6 H_2O	SIGMA-ALDRICH	087K0204	September 2010
$MgSO_4$ x 7 H_2O	MERCK	A895286	31 August 2012
KH_2PO_4	REANAL (lach:ner)	PP/2008/04457/0	31 July 2012
K_2HPO_4	REANAL	KBM55318	September 2012
Na_2HPO_4 x $12H_2O$	REANAL	KBM60050	November 2014
NH_4Cl	MERCK	A691045	30 September 2010

3.4.3. Ratio of ingredients

1 mL of the stock solutions a) - d) were combined and filled to a final volume of 1000 mL with deionised water. The test medium was aerated for 20 minutes and allowed to stand for about 20 hours at the test temperature. The dissolved oxygen concentration was about 8.5 mg/L at about 22 °C.

3.5. TEST SYSTEM

The inoculum:	Activated sludge, microorganisms from a domestic waste water treatment plant.
Origin:	The activated sludge was supplied from the sewage plant for domestic sewage in Veszprém, Hungary.
Conditioning:	The activated sludge used for this study was washed by centrifugation (for 10 min.) and the supernatant liquid phase was decanted. The solid material was re-suspended in isotonic saline solution and again centrifuged (for 10 min.). This procedure was repeated twice. An aliquot of the final sludge suspension was weighed, dried and the ratio of wet sludge to its dry weight was determined. Based on this ratio, calculated aliquots of washed sludge suspension, corresponding to 4 g dry material per litre were mixed with test water (see below) and then aerated until use. Before use the sludge was filtered through cotton wool.

3.6. TEST UNITS

Type and Size: BOD bottles (300 ml) with special neck and glass stoppers.
Identification: Each test flask was uniquely identified with study code, test group, days of measurement and replicate number.

3.7. TEST CONDITIONS

The test was carried out in an incubator and controlled environment room (during the formulation and oxygen measuring) at a temperature of 22 ± 2°C according to guideline. The test flasks were placed into an incubator and kept at 21.6-23.0°C, in the dark. The temperature was measured on weekdays during the experiment.
The oxygen concentration of test water was 8.5 mg/L at the start of the test.
The pH value of the test water was checked prior study start. The pH of the test water was 7.21.
The test conditions were measured with suitable instruments and documented in the raw data.

3.8. PREPARATION OF THE TEST SOLUTIONS

The respective amount of Ethylene Dibromide Industrial (EDB) was weighed in directly to reach the required test item concentration of 15.0 mg/L.
During the performance of the test the test solutions were ultrasonicated for 5 min. to ensure a good dispersion.
The chosen test item concentration was based on the measured chemical oxygen demand (COD): 0.4 ±0.01 mg O_2/mg test item and on the performed 14-d preliminary test.

The components were applied in the amounts/volumes following ratio in the test flasks:

1.) Test Item (flasks 1a and 1b)

Based on the chemical oxygen demand (COD) of 0.4 mg O_2/mg test item, 51.9 mg of Ethylene Dibromide Industrial (EDB) was thoroughly mixed into 3.46 litres of aqueous test medium (corresponding to 15.0 mg/L test item, respectively a COD of about 6.00 mg O_2/L).

2.) Procedure Control: Sodium benzoate (flasks 2a and 2b)

Based on the theoretical oxygen demand ($ThOD_{NH4}$) of Sodium benzoate (1.67 mg O_2 per mg) (details on calculation are given in the guidelines), stock solution* corresponding to 12.096 mg of Sodium benzoate was mixed into 3.36 litres of aqueous test medium (corresponding to 3.6 mg/L reference item, respectively a $ThOD_{NH4}$ of about 6.012 mg O_2/L).

* The concentration of the stock solution was: 360 mg/L.

3.) Inoculum Control (flasks 3a and 3b)

Only filtered inoculum was added to 3.40 litres of aqueous test medium.

4.) Toxicity Control (flasks 4a and 4b)

51.9 mg of Ethylene Dibromide Industrial (EDB) and reference item stock solution* (34.6 mL) were mixed into 3.46 litres of aqueous test medium corresponding to 15.0 mg/L test item (COD of 6.00 mg O_2/L) and 3.6 mg/L reference item ($ThOD_{NH4}$ of 6.012 mg O_2/L).

* The concentration of the reference item stock solution was: 360 mg/L.

Microbial inoculum (0.5 ml per litre) was added to each preparation bottle.

3.9. COURSE OF THE TEST

3.9.1. Preparation of Test Flasks

Sufficient number of BOD flasks was cleaned with 5 - 10 mL of a wash liquid (2.5 g iodine and 12.5 g potassium iodide per litre of 1 % w/v sulphuric acid) by shaking well to coat the bottle walls. After allowing standing for 15 minutes, the wash liquid was poured off, and the bottles were thoroughly rinsed with tap water and deionised water. Then, the previously described test solutions were filled into the bottles bubble-free until the bottles were completely filled. Then they were tightly closed with glass stopper.

3.9.2. The Test Bottles

The number of test bottles was the follow:

— 10 bottles containing the test item and inoculum
— 10 bottles containing the reference item and inoculum (procedure control)
— 10 bottles containing only inoculum (inoculum control)
— 10 bottles containing the test item, reference item and inoculum (toxicity control)

3.10. MEASUREMENTS

3.10.1. COD Measurement

The COD (chemical oxygen demand) of the test item were determined in using Lovibond® COD Measuring System.

3.10.2. Measurement of Oxygen

The incubation period of the closed bottle test was 28 days.
The oxygen concentrations were measured with oxygen meter with a stirring O_2 electrode. Oxygen measurements were performed in duplicate on days 0, 7, 14, 21 and 28.

3.10.3. Measurement of Temperature

Temperature was measured continuously and registered on weekdays.

3.11. CALCULATION OF RESULTS

3.11.1. Calculation of BOD

The BOD (mg O_2 per mg test item) expected after each period was calculated as follows:

$$\frac{\text{mg } O_2\text{/L of T.i. and/or R.i. - mg } O_2\text{/L of i.control}}{\text{mg T.i. and/or R.i./L in flask}}$$

where:

T.i. = test item
R.i. = reference item,
i.control = inoculum control

3.11.2. Calculation of Biodegradation %

The percentage biodegradation of the test item and of the reference item was calculated as follows:

$$\frac{\text{BOD (mg } O_2\text{/mg T.i. or R.i.)}}{\text{COD (mg } O_2\text{/mg T.i.) or ThOD}_{NH4}\text{ (mg } O_2\text{/mg R.i.)}} \times 100$$

where:

T.i. = test item
R.i. = reference item,
i.control = inoculum control

3.12. ARCHIVES

The study documents and samples:

- study plan and amendment,
- all raw data,
- sample of the test item,
- study report and any amendments,
- correspondence

are stored in the archives of LAB Research Ltd., Hungary 8200 Veszprém, Szabadságpuszta according to the Hungarian GLP and our SOPs.

3.13. DISTRIBUTION OF THE FINAL REPORT

Sponsor: 1 x pdf
1 x copy, bound
1 x copy, unbound

Archive: 1 x original, bound

3.14. DEVIATION FROM THE STUDY PLAN

Concerning:	Date of Draft Report
According to the Amendment 1 to Study Plan:	01 September 2010
Deviation:	08 September 2010
Reason for this change:	Technical
Presumed Effect on the Study:	None

Concerning:	Storage of the Test Item
According to the Study Plan:	room temperature;15-25°C (humidity 50 % ± 20)
Deviation:	room temperature;15-25°C (humidity 50 % ± 20), protect from light
Reason for this change:	Technical
Presumed Effect on the Study:	None

4. REFERENCES

1 Council Regulation (EC) No 440/2008,Method C.4-E “Closed Bottle Test", Official Journal of the European Union L 142 of 31 May 2008

2. OECD Guideline for Testing of Chemicals No. 301 D: "Ready Biodegradability: Closed Bottle Test", adopted July 17, 1992

3. EPA Guideline 712-C-98-076: OPPTS 835.3110, "Ready Biodegradability", January 1998

4. Hungarian Good Laboratory Practice Regulations: 9/2001 (III. 30) EÜM-FVM joint decree of the Minister of Health and the Minister of Agriculture and Regional Development which corresponds to the OECD GLP, 1997

5. OECD Principles of Good Laboratory Practice, adopted by Council on 26th November 1997 [C(97)186/Final], Environment Directorate, Organisation for Economic Co-operation and Development, ENV/MC/CHEM(98)17, Paris 1998

6. Directive 2004/10/EC of the European Parliament and of the Council of 11 February 2004 on the harmonisation of laws, regulations and administrative provisions relating to the application of the principles of good laboratory practice and the verification of their applications for tests on chemical substances (codified version)

5. RESULTS

Table 2. Dissolved Oxygen Concentrations at Different Time Intervals during the Exposure Period of 28 Days

Treatment	Concentration [mg/L]	Flask No.	mg O_2/L after n days of exposure				
			0	**7**	**14**	**21**	**28**
Test item	15.0	1a	8.4	7.8	7.6	7.2	7.0
		1b	8.4	7.8	7.6	7.2	7.1
		mean	**8.40**	**7.80**	**7.60**	**7.20**	**7.05**
Reference item	3.6	2a	8.4	3.4	3.1	2.8	2.5
		2b	8.4	3.4	3.1	2.7	2.6
		mean	**8.40**	**3.40**	**3.10**	**2.75**	**2.55**
Inoculum control	–	3a	8.4	8.1	7.6	7.6	7.4
		3b	8.4	8.1	7.6	7.5	7.2
		mean	**8.40**	**8.10**	**7.60**	**7.55**	**7.30**
Toxicity control	Test item: 15.0 Reference item: 3.6	4a	8.4	3.2	2.6	2.4	2.2
		4b	8.4	3.2	2.7	2.6	2.3
		mean	**8.40**	**3.20**	**2.65**	**2.50**	**2.25**

Table 3. Oxygen Depletion at Different Time Intervals during the Exposure Period of 28 Days

Treatment	Concentration [mg/L]	Flask No.	mg O_2/L after n days of exposure			
			7	**14**	**21**	**28**
Test item	15.0	1a	0.30	0.00	0.35	0.30
		1b	0.30	0.00	0.35	0.20
Reference item	3.6	2a	4.70	4.50	4.75	4.80
		2b	4.70	4.50	4.85	4.70
Toxicity control	Test item: 15.0 Reference item: 3.6	4a	4.90	5.00	5.15	5.10
		4b	4.90	4.90	4.95	5.00

oxygen depletion : (mt0 - mtx) - (mbo - mbx), where:

mt0 : oxygen concentration (mg/L) of test group on day 0 (1a, 2a, 4a and 1b, 2b, 4b from Table 2)
mtx: oxygen concentration (mg/L) of test group on day x (1a, 2a, 4a and 1b, 2b, 4b from Table 2)
mb0: oxygen concentration (mg/L) of inoculum blank on day 0 (mean of 3a and 3b from Table 2)
mbx: oxygen concentration (mg/L) of inoculum blank on day x (mean of 3a and 3b from Table 2)

Table 4. BOD at Different Time Intervals during the Exposure Period of 28 Days

Treatment	Concentration [mg/L]	Flask No.	BOD after n days of exposure			
			7	14	21	28
Test item	15.0	1a	0.02	0.00	0.02	0.02
		1b	0.02	0.00	0.02	0.01
Reference item	3.6	2a	1.31	1.25	1.32	1.33
		2b	1.31	1.25	1.35	1.31
Toxicity control	Test item: 15.0 Reference item: 3.6	4a	0.26	0.27	0.28	0.27
		4b	0.26	0.26	0.27	0.27

$$\text{BOD} = \frac{\text{mg } O_2 \text{ of T.i. and/or R.i.} - \text{mg } O_2 \text{ of i.control}}{\text{mg T.i. and/or R.i. in flask}} = \text{mg } O_2/\text{mg T.i and/or R.i.}$$

where:

T.i. = test item
R.i. = reference item
i.control = inoculum control

Table 5. Percentage Biodegradation at Different Time Intervals during the Exposure Period of 28 Days

Treatment	Concentration [mg/L]	Flask No.	Percent of biodegradation after n days of exposure			
			7	14	21	28
Test item	15.0	1a	5.0	0.0	5.8	**5.0**
		1b	5.0	0.0	5.8	**3.3**
		mean	5.0	0.0	5.8	**4.2**
Reference item	3.6	2a	78.3	75.0	79.2	**80.0**
		2b	78.3	75.0	80.8	**78.3**
		mean	78.3	75.0	80.0	**79.2**
Toxicity control	Test item: 15.0 Reference item: 3.6	4a	25.5	26.0	26.8	**26.5**
		4b	25.5	25.5	25.8	**26.0**
		mean	25.5	25.8	26.3	**26.3**

$$\text{Biodegradation \%} = \frac{\text{BOD (mg O}_2\text{/mg T.i. or R.i.)}}{\text{COD (mg O}_2\text{/mg T.i.) or ThOD}_{NH4}\text{ (mg O}_2\text{/mg R.i.)}} \times 100$$

where:

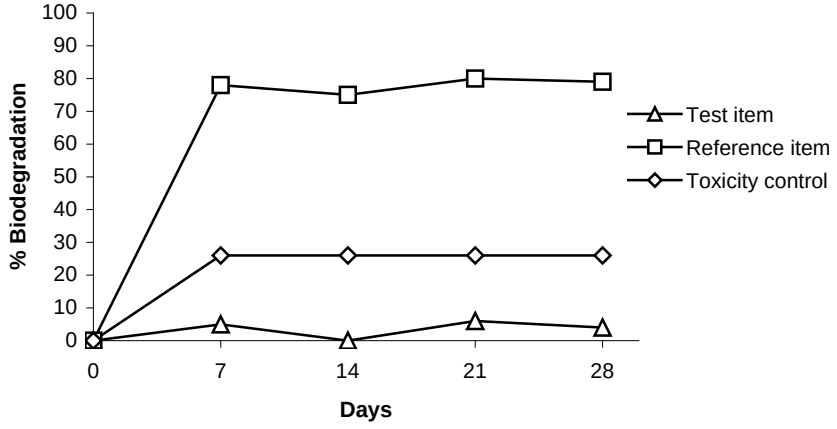
T.i. = test item
R.i. = reference item
i.control = inoculum control

COD of test item = 0.4 ± 0.01 mg O_2/mg test item
$ThOD_{NH4}$ of reference item = 1.67 mg O_2/mg reference item

The biodegradation in the toxicity control was calculated according to the following formula:

$$\frac{\text{BOD (mg O}_2\text{/mg T.i. and R.i.)}}{[\text{COD (mg O}_2\text{/mg T.i.)} + \text{ThOD}_{NH4}\text{ (mg O}_2\text{/mg R.i.)}] * 1/2} \times 100$$

Figure 1. Biodegradation of the Test and the Reference Item and the Toxicity Control during the Exposure Period of 28 Days



6. CONCLUSION

The test item Ethylene Dibromide Industrial (EDB) was investigated for its ready biodegradability in a Closed Bottle Test over a period of 28 days. The biodegradation was followed by the oxygen uptake of the microorganisms during exposure. As a reference item Sodium benzoate was tested simultaneously under the same conditions as the test item, and functioned as a procedure control.

The test system was a microbial inoculum of good quality, collected from the sewage plant for domestic sewage. The sludge was washed by centrifugation filtered through cotton wool and aerated until use. Based on the determined dry weight content, the washed sludge suspension contained 4 g dry material per litre.

Under the test conditions the percentage biodegradation of Ethylene Dibromide Industrial (EDB) reached a mean of 4.2 % after 28 days based on the measured COD of the test item.
The test item can therefore be considered to be not ready biodegradable. According to the test guidelines the pass level for ready biodegradability is removal of 60 % ThOD.

The reference item Sodium benzoate was sufficiently degraded to a mean of 75.0 % after 14 days, and to a mean of 79.2 % after 28 days of incubation, based on $ThOD_{NH4}$, thus confirming the suitability of the used activated sludge inoculum.

In the toxicity control containing both, the test item and the reference item Sodium benzoate, a mean of 25.8 % biodegradation was noted within 14 days and 26.3 % biodegradation after 28 days of incubation.

According to the test guidelines **the test item can be assumed to be not inhibitory at the applied concentration level of 15.0 mg/L on the activated sludge microorganisms** because degradation was >25 % within 14 days.

APPENDIX

COPY OF THE GLP CERTIFICATE

ORSZÁGOS GYÓGYSZERÉSZETI INTÉZET
National Institute of Pharmacy

H-1051 Budapest, Zrinyi u. 3.
Mail: 1372 P.O. Box 450.
Phone: +36 1 8869-300
Fax: +36 1 8869-460
E-mail: ogyi@ogyi.hu

Budapest, 20th December 2008
No: 38625/48/2007
Our ref.: Szilvia Karsai
Subject: GLP Certificate

GOOD LABORATORY PRACTICE (GLP) CERTIFICATE

Based on the Inspection report and the discussion of follow up activities it is hereby certified that the test facility

LAB Research Ltd.
H-8201 Veszprém, Szabadságpuszta, Hungary

is able to carry out **Physical-chemical testing, Toxicity studies, Mutagenicity studies, Environmental toxicity studies on aquatic and terrestrial organisms, Studies on behaviour in water, soil and air; bioaccumulation, Bioanalytical, Analytical and clinical chemistry testing** compliance with the Principles of GLP (Good Laboratory Practice).

Date of the inspection: **13-22 October 2008.**

This GLP Certificate is valid for 2 years.

Zsuzsanna Szepezdi, Ph. D.
Director-General