

Lonza

Bardac-22[®]

Summary of Data

CONTENTS SUMMARY BARDAC-22	page
A. Product Information	
A.1. Product Information	3 - 5
A.2. Summary of specifications and properties	6
A.3. Analytical procedure (Two phase titration 2871-2)	7 - 9
A.4. Analytical procedure by thinlayer chromatography	10
A.5. Material Safety Data Sheet	11 - 20
A.6. Label BARDAC-22	21
 B. Registrations	
B.1. Switzerland	22
B.2. USA	22
B.3. Germany	22
B.4. Netherlands	23
B.5. France	23
B.6. Austria	23
B.7. Spain	23 - 24
B.8. Sweden	24
B.9. Finland	24
 C. Microbiological Testresults	
C.1. Bacteria	
USA	25 - 27
Germany	27 - 28
Switzerland	28
France	29 - 30
Italy	30 - 31
Belgium	31
Netherlands	32
United Kingdom	32 - 33
Austria	33
C.2. Fungi	34 - 35
C.3. Algae	36
C.4. Viruses	37 - 38
 D. Toxicological Testresults	
D.1. Short term toxicology	39
D.2. Long term toxicology	39
D.3. Genetic toxicology	39
E. Special Applications	40 - 42
 F. Ecological and Ecotoxicological Data	
F.1. Degradation and Transformation	43
F.2. Toxicity to aquatic organisms	44

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A.1 Product Information

Bardac-22[®]

The modern and safe biocide.

Broad spectrum of activity against both gram positive and gram negative bacteria.

Fungicide and mildewcide.

Active against enveloped viruses (e.g. Hepatitis B, HIV).

High tolerance to hard water.

Maintains efficacy in presence of heavy organic soiling such as blood and protein.

Good surfactant and wetting properties.

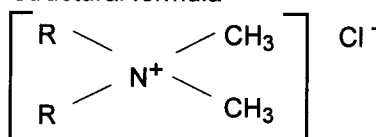
Worldwide acceptance based on registrations approval and official lists.

Toxicological and ecological documentation.

1. **Active matter**

N,N-Didecyl-N,N-dimethylammoniumchloride

Structural formula



R = C₁₀H₂₁

1.3 UN No.:

1.4 INCI-Name

1.1 CAS No.:

1.2 EINECS No.:

2920

Didecyldimonium chloride

2. **Specifications**

2.1	Appearance at 20°C	clear liquid
2.2	Colour, Apha	100 max
2.3	pH 1% aqueous solution	6.5 - 8.0
2.4	Assay (Titration, MW 361)	50.0 - 52.0 %
2.5	free Amine + Amine HCl	1.0 % max
2.6	Ash	0.5 % max.
2.7	Water, KF	26.5 - 30.5 %
2.8	Isopropanol	19.5 - 24.5 %

3. **Properties**

3.1	Odour	aromatic, smell of IPA
3.2	Density	0.89 g/cm ³
3.3	Viscosity (Brookfield, sp.1, 10 rpm, 20°C)	25 cps
3.4	Average Molecular weight	361
3.5	Flash Point (Abel Pensky cc)	29°C
3.6	Surface tension (1% aqueous solution)	27 mN/m
3.7	Ionogenicity	cationic
3.8	Freeze thaw stability	good
3.9	Solubility	soluble in water
3.10	Compatibility	not compatible with anionics
3.11	Setting point	< - 30°C

4. Registrations

- 4.1 Europe European Inventory of Existing Chemical Substances (EINECS)
- 4.1.1 Switzerland As precaution against athlete's foot- October 19,1998 BAG-E Nr.1132
BAG T- 23917 GK 4 – December 10,2001
- 4.1.2 Germany Approved with BgVV (former **bga**, Berlin) No. 6595.00.00 under the name of Azolat.
Recorded in the XXXVIth recommendation of BgVV (former **bga**, Berlin)
- 4.1.3 France Specified in positive list for food and dairy industry.
Approved as fungicide to prevent from mycoses (athlete's foot)
- 4.1.4 Netherlands Registered under No. 7086 N.
- 4.1.5 Spain Registered under No. 99-00-00318 for use in disinfectant cleaners for general purpose.
Registered under No. 99-00-00318 HA for use in disinfectant cleaners for food industry.
- 4.2 U S A EPA registration No. 6836-18.
Toxic Substances Control Act (TSCA) Inventory.
FDA 21 CFR 178.1010 approval
- 4.3 Japan Japanese Handbook of Chemical Substances (MITI:9-1971).
- 4.4 Australia Australian Inventory of Chemical Substances (AICS).
- 4.5 Canada Canadian Core Domestic Substances List (CORE DSL).

5. Antimicrobial efficacy

5.1 BACTERIA

The bactericidal efficacy has been tested and shown according to the following test procedures:

DVG	(Germany)
DGHM	(Germany)
AFNOR	(France)
5-5-5-Test	(Netherlands)
Kelsey-Sykes	(UK)
AOAC	(USA)

5.2 FUNGI & YEAST

The fungicidal activity of Bardac-22 has been demonstrated in presence of:

Aspergillus niger
Penicillium glaucum
Candida albicans
Trichophyton mentagrophytes
Microsporum canis
Cladosporium cladosporoides
Penicillium verrucosum
Aspergillus versicolor

5.3 ALGAE

The algaestatic concentration of Bardac-22 amounts to 0.5 ppm.

The algaecidal concentration of Bardac-22 was shown to be 1.0 ppm.

5.4 VIRUS

The virucidal efficacy of Bardac-22 has been demonstrated in presence of many enveloped viruses incl. Hepatitis B and HIV.

6. Other investigations

All raw materials used for the production of Bardac-22 are of non animal origin.

7. Use areas

Disinfectant and disinfectant cleaner for hospitals, food industry, industrial kitchens and I+I applications.

Laundry disinfectant.

Fungicide (prevention from athlete's foot).

Wood treatment (sapstain and decay).

Water treatment (swimming pools, cooling towers etc).

Slimicide (paper industry).

Algaecide (walls, piles etc).

8. Recommendations to formulate

Incompatible with anionic detergents.

Synergistic effects in combination with aldehydes and complexing agents (e.g. EDTA).

9. Analytical procedures

Titration (ISO 2871-2)

10. Storage

Product is supplied as follows:

Type:	iron drum	polyethylene drum	IBC-container	bulk
Weight net:	50 kgs	190 kgs	890 kgs	

It can be stored in the sealed original packaging over a period of two years.

11. Regulatory information

refer to MSDS

12. Toxicological information

refer to MSDS

13. Ecological and ecotoxicological information

refer to MSDS

The information contained herein is believed to be correct and corresponds to the latest state of scientific and technical knowledge. However, no warranty is made, either expressed or implied, regarding its accuracy or the results to be obtained from the use of such information. No statement is intended or should be construed as a recommendation to infringe any existing patent.

A.2. Chemical-Physical Properties

Summary of Chemical-Physical Properties of BARDAC-22		
1	Assay Quat (Molecularweight 361)	50- 52 %
2	% Solvent (2-Propanol)	19.5 % min
3	% Water (K.Fischer)	30.5 % max
4	Colour (Apha)	100 max
5	pH 1% aqueous solution	6.5 – 8.0
6	Appearance	colourless to slightly yellow liquid
7	Odour	aromatic, smell of IPA
8	Density (20°C)	0.91 g/ml
9	Viscosity (Brookfield, sp.1, 10 rpm,20°C)	25 cps
10	Average Molecular weight	361
11	Flashpoint (Abel Pensky, cc)	29 °C
12	Surface tension 0.1 % 1.0 % 5.0 %	31 mN/m 27 mN/m 26 mN/m
13	Ionogenicity	cationic
14	Freeze thaw stability	good
15	Solubility after 20 hrs at 20°C (1%, 10% and 20% aqueous solution)	clear and homogenous
16	Compatibility	not compatible with anionics
17	Stock point	< - 30° C
18	Total free Amine and Amine HCl max. (MW free amine = 311) (MW Amine HCl = 347)	< 1.0 %
19	NaCl max.	0.5 %
20	Decompositionpoint Bardac-22 100% active	130 - 150° C
21	Vapour pressure, Bardac-22 100% active	< 5,6 . 10-6 Torr 20° C
22	Specific heat: at 20°C at 50°C	2.94 KJ/kg K 3.09 KJ/kg K
23	Content of heavy metals (as Pb)	< 10 µg/gr
24	Refraction index 20°C	1.420 - 1.424
25	Critical micell concentration (CMC)	0,14 g/l
26	Surface tension at CMC (20°C)	27.8 mN/m

A.3. Analytical procedure related to ISO 2871-2

Memorandum

Subject Determination of cationic-active matter content
File CSPE / CSAT
Author Dr.Florian Lichtenberg
Testmethod: Two phase titration

1. Principle

The cationic-active matter in a sample is titrated in a two-phase (aqueous chloroform) system against a standard anionic surface-active agent in the presence of an indicator consisting of mixed anionic and cationic dyes. The cationic surface-active agent present in the sample initially reacts with the anionic dye to form a salt which dissolves in the chloroform layer, imparting a blue colour to this layer.

During the titration, the anionic surface-active agent displaces the anionic dye and, at the end point, forms a salt with the cationic dye, imparting a greyish-pink colour to the chloroform layer.

2. Reagents:

During the analysis, use only reagents of recognized analytical grade and only distilled water or water of at least equivalent purity complying with the specifications for grade 3 of ISO 3696.

2.1 **Chloroform**, P_{20} , 1,48 g/ml, distilling between 59,5 °C and 61,5 °C.

2.2 **Sodium lauryl sulfate (Sodium dodecyl sulfate)**
 $[\text{CH}_3(\text{CH}_2)_{11}\text{OSO}_3\text{Na}]$, standard volumetric solution,
 $c(\text{C}_{12}\text{H}_{25}\text{NaO}_4\text{S}) = 0,004 \text{ mol/l}$.

While preparing the standard volumetric solution as described in 2.2.2, check the purity of the solid sodium lauryl sulfate used as described in 2.2.1.

2.2.1 Determination of purity of sodium lauryl sulfate.

Weigh, to the nearest 1 mg, $5 \text{ g} \pm 0,2 \text{ g}$ of the solid product into a 250 ml round bottom flask with ground-glass neck. Add exactly 25 ml of a standard volumetric sulfuric acid solution, $c(0,5\text{H}_2\text{SO}_4) = 1 \text{ mol/l}$, and reflux using a water condenser. During the first 5 min to 10 min, the solution will thicken and tend to foam strongly; control this by removing the source of heat and swirling the contents of the flask.

In order to avoid excessive foaming, instead of refluxing, the solution may be left on a boiling water bath for 60 min.

After a further 10 min, the solution will become clear and foaming will cease. Reflux for a further 90 min.

Remove the source of heat, cool the flask and carefully rinse the condenser with 30 ml of ethanol followed by water.

Add a few drops of ethanolic phenolphthalein solution (concentration 10 g/l), and titrate the solution with sodium hydroxide solution $c(\text{NaOH}) = 1 \text{ mol/l}$.

Carry out a blank test by titrating 25 ml of the 1 mol/l sulfuric acid solution with the 1 mol/l sodium hydroxide solution.

Calculate the purity, t , expressed as a percentage by mass, of the sodium lauryl sulfate using the formula

$$\frac{28,84 (V_1 - V_0) c_0}{m_1}$$

where

V_0 is the volume, in millilitres, of the 1 mol/l sodium hydroxide solution used for the blank test;

V_1 is the volume, in millilitres, of the 1 mol/l sodium hydroxide solution used for the test portion of sodium lauryl sulfate taken;

c_0 is the exact concentration, expressed in moles of NaOH per litre, of sodium hydroxide solution used;

m_1 is the mass, in grams, of the test portion of sodium lauryl sulfate taken.

2.2.2 Preparation of standard volumetric sodium lauryl sulfate solution.

Weigh, to the nearest 1 mg, between 1,14 g and 1,16 g of sodium lauryl sulfate and dissolve in 200 ml of water. Transfer the solution quantitatively to a 1 000 ml one-mark volumetric flask (3.3.) fitted with a ground-glass stopper, and dilute to the mark with water.

Calculate the exact concentration c_2 , expressed in moles of $C_{12}H_{25}NaO_4S$ per litre, of the solution thus obtained, using the formula

$$\frac{m_2 t}{288,4 \times 100}$$

where

m_2 is the mass, in grams, of sodium lauryl sulfate used to prepare the solution;

t has the same meaning as in 2.2.1

2.3 Mixed indicator solution ¹⁾.

2.3.1 Stock solution.

This solution shall be prepared from acid blue 1 and dimidium bromide.

2.3.1.1 Acid blue 1²⁾ (Colour Index 42045)

(disodium-4',4''-dinitrilodiethyltriphenylmethane-2,4-disulfonate).

2.3.1.2 Dimidium bromide (3,8-diamino-5-methyl-6-phenylphenanthridinium bromide)

2.3.1.3 Preparation of the stock solution.

Weigh, to the nearest 1 mg, 0,5 g \pm 0,005 g of dimidium bromide (2.3.1.2) into a 50 ml beaker, and 0,25 g \pm 0,005 g of acid blue 1 (2.3.1.1) into a second 50 ml beaker.

Add between 20 ml and 30 ml of hot 10 % (V/V) ethanol to each beaker.

Stir until dissolved and transfer the solutions to a 250 ml one-mark volumetric flask. Rinse the beakers into the volumetric flask with the ethanol and dilute to the mark with the ethanol.

2.3.2 Acid solution.

Add 200 ml of water to 20 ml of the stock solution (2.3.1) in a 500 ml one-mark volumetric flask. Add 20 ml of approximately 245 g/l sulfuric acid solution, mix and dilute to the mark with water. Store in the dark.

3 Apparatus:

Ordinary laboratory apparatus, and

3.1 Flask or measuring cylinder, 250 ml capacity, with ground-glass stopper

3.2 Burette, 25 ml capacity complying with the specifications for class A of ISO 385-1.

3.3 One-mark volumetric flask, 1000 ml capacity, with ground-glass stopper, complying with ISO 1042.

4 Procedure:

4.1 Test portion.

Weigh, to the nearest 0,5 mg, sufficient of the laboratory sample to contain between 0,002 mol and 0,003 mol of cationic-active matter.

NOTE 1 Table 1, which has been calculated on the basis of a relative molecular mass of 360, may be used as a rough guide.

Table 1 - Guide to mass of test portion

Expected cationic-active % (m/m)	Mass of test portion g
10	10
20	5
100	1

1) This mixed indicator is available commercially in the form of a basic solution, which should be acidified and diluted before use.

2) Acid blue 1; VS blue and disulfine blue VN 150 are examples of suitable products available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of these products.

4.2 Determination.

Dissolve the test portion (4.1) in water and transfer to the 1 000 ml one-mark volumetric flask (3.3). Dilute to the mark with water and mix well.

By means of a pipette, transfer 25 ml of this solution to the 250 ml flask or measuring cylinder (3.1).

Using measuring cylinders, add 10 ml of the mixed indicator solution (2.3), 15 ml of chloroform (2.1) and 25 ml of water. Mix well.

Fill the burette (3.2) with the sodium lauryl sulfate solution (2.2) and titrate; stopper the flask or measuring cylinder after each addition and shake well.

NOTE 2 The lower (chloroform) layer will be coloured blue.,

Continue the titration, drop by drop, with repeated vigorous shaking, until at the end point the blue colour is discharged and the lower (chloroform) layer turns greyish-pink.

5 Expression of results.

5.1 Calculation:

The content, expressed as a percentage by mass, of cationic-active matter is given by the formula

$$\frac{VcM_r \times 1\,000 \times 100}{25 \times 1\,000m_o}$$

$$= \frac{4VcM_r}{m_o}$$

where

- V* is the volume, in millilitres, of the sodium lauryl sulfate solution (2.2) used for the titration;
- c* is the actual concentration, expressed in moles of C₁₂H₂₅NaO₄S per litre, of the sodium lauryl sulfate solution (2.2);
- M_r* is the mean relative molecular mass of the cationic-active matter (in the case of Bardac-22 = 361);
- m_o* is the mass, in grams, of the test portion (4.1).

5.2 Precision.

5.2.1 Repeatability:

1,6 % of the mean value.

In the normal and correct operation of the method, the difference between two individual results obtained within the shortest feasible time interval by the same operator using the same apparatus and identical test material will exceed the repeatability value on average not more than once in 20 cases.

5.2.2 Reproducibility:

4 % of the mean value.

In the normal and correct operation of the method, the difference between individual results obtained by two different laboratories using identical test material will exceed the reproducibility value on average not more than once in 20 cases.

A.4. Analytical procedure by thinlayer chromatography

Memorandum

Subject ANALYSIS OF BARDAC-22
File SCD
Author Dr.F.Lichtenberg
Date August 24,1989
Pages 1

Identification of BARDAC-22
Method to identify BARDAC-22 by thinlayer chromatography

Material: Merck, Silicagel 60 (Kieselgel 60) Fluorescence indicator F 254

Test solution: 1 % Bardac-22 in Isopropanol

Eluate:

65	ml Toluene
26	ml Glacial acetic acid
7.5	ml Acetone
3	ml Methanol
2.5	ml water

The eluate must be clear.
If necessary, add some acetone.
Prepare a fresh solution before each test.

Spray reagent solution A; 800 mg Bromphenolblue
700 ml dist. water

Spray reagent solution B: 100 g Na₂CO₃
400 ml 0.1 n NaOH

Mix 35 ml solution A with 15 ml solution B.
Prepare for each test.

Preparation:

A TC chamber will be saturated with the described eluate. Place 5 µl test solution on the starting line of the TC plate. After a contact time of 1.5 hrs. the TC-plate will be dried at 50°C until no odour of acetic acid is observed.

The TC plate will be sprayed with spray reagent and again dried at 50°C.

The comparison of the R_f value with that one of the standard (DDAC) proves the identity of the tested sample.

CSAT/Dr.F.Lichtenberg

A.5. Material Safety Data Sheet

Safety Data Sheet

Bardac 22

Version: 29.12.2003 / EN

1. Identification of the substance/preparation and the company/undertaking

Trade name : Bardac 22

Address : Lonza Ltd
Muenchensteinerstrasse 38
CH-4002 Basel, Switzerland
Telephone: +41 61 316 81 11

Emergency telephone number : Lonza Ltd, CH-4002 Basel, Switzerland
Telephone: +41 61 313 94 94 (24h)

2. Composition/information on ingredients

Components / EC Label	Concentration
N,N-Didecyl-N,N-dimethylammonium chloride (CAS-No.: 7173-51-5) (EEC-No.: 230-525-2) C; R22, R34	ca. 50 % (*)
Propane-2-ol (CAS-No.: 67-63-0) (EEC-No.: 200-661-7) F, Xi; R11, R36, R67	ca. 20 % (*)
Water (CAS-No.: 7732-18-5) (EEC-No.: 231-791-2)	ca. 30 %

R-phrases) see chapter 16

(*) Components with workplace control parameters see chapter 8

3. Hazards identification

Classification

Flammable.
Harmful if swallowed.
Causes burns.
Vapours may cause drowsiness and dizziness.
Very toxic to aquatic organisms.

4. First aid measures

Inhalation : Move to fresh air. Call a physician immediately. If breathing is irregular or stopped, administer artificial respiration.

Skin contact : After contact with skin, wash immediately with plenty of soap and water. Call a physician immediately. Take off all contaminated clothing immediately.

Safety Data Sheet

Bardac 22

Version: 29.12.2003 / EN

- Eye contact : Immediately flush eye(s) with plenty of water. Call a physician immediately.
- Ingestion : Call a physician immediately. Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person.

Notes to physician

- Symptoms : Causes severe irritation of eyes, skin and mucous membranes.

5. Fire-fighting measures

- Suitable extinguishing media : dry powder, water spray, foam
- Specific hazards during fire fighting : Heating or fire can release toxic gas.
- Special protective equipment for fire-fighters : In the event of fire, wear self-contained breathing apparatus.
- Additional advice : Use water spray to cool unopened containers.

6. Accidental release measures

- Personal precautions : Use respirator when performing operations involving potential exposure to vapour of the product.
- Environmental precautions : Do not flush into surface water or sanitary sewer system.
- Methods for cleaning up : Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

Safety Data Sheet

Bardac 22

Version: 29.12.2003 / EN

7. Handling and storage

Handling

Safe handling advice: : Avoid contact with skin and eyes. Provide sufficient air exchange and/or exhaust in work rooms.

Advice on protection against fire and explosion : Highly flammable. Keep away from sources of ignition - No smoking. Take precautionary measures against static discharges.

Storage

Requirements for storage areas and containers : Keep container tightly closed. To maintain product quality, do not store in heat or direct sunlight. Keep in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

Components with workplace control parameters

N,N-Didecyl-N,N-dimethylammonium chloride (CAS-No.: 7173-51-5)

Remarks : no data available

Propane-2-ol (CAS-No. 67-63-0):

DFG-MAK/BAT/TRK (2002)

Exposure limit(s) : 200 ml/m³ 500 mg/m³
Damage to fetus unlikely if the occupational exposure limit values are not exceeded.

Short term exposure limit : Peak-limit category II(2)

SUVA-MAK (2003)

Exposure limit(s) : 200 ml/m³ 500 mg/m³
Biological monitoring
Damage to fetus unlikely if the occupational exposure limit values are not exceeded.

Short term exposure limit : 400 ml/m³ ; 1000 mg/m³
4 times 15 min. per shift

ACGIH-TLV

Exposure limit(s) : 200 ml/m³
Carcinogenicity: group A4

Short term exposure limit : 400 ml/m³

IDLH value : 2000 ppm

Safety Data Sheet

Bardac 22

Version: 29.12.2003 / EN

Personal protective equipment

- Hygiene measures : Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.
- Respiratory protection : Use respirator when performing operations involving potential exposure to vapour of the product.
- Hand protection : rubber or plastic gloves
- Eye protection : Wear eye/face protection.
- Skin and body protection : Wear suitable protective clothing, gloves and eye/face protection.

9. Physical and chemical properties

Appearance

- State of aggregation : liquid
- Colour : light yellow
- Odour : solvent

Safety data

- pH : 6 - 8 (10 g/l ; 20 °C)
- Boiling point/range : > 80 °C
- Flash point : closed cup : 29 °C
Method: DIN 51755 Part 1
- Density : 0,890 g/cm³ (20 °C)
Method: DIN 51757
- Water solubility : completely miscible
- Viscosity, dynamic : 25 mPa.s (20 °C)

10. Stability and reactivity

- Conditions to avoid: : no data available
- Hazardous reactions : Stable under normal conditions.

Safety Data Sheet

Bardac 22

Version: 29.12.2003 / EN

11. Toxicological information

- Acute oral toxicity (LD50) : 645 mg/kg
Species: rat
Method: OECD Test Guideline 401
- Skin irritation : corrosive
Species: rabbit
Exposure time: 4 h
Method: OECD Test Guideline 404

12. Ecological information

The following ecotoxicological data refer to:

N,N-Didecyl-N,N-dimethylammonium chloride (CAS-No.: 7173-51-5)

Ecotoxicity effects

- Toxicity to fish (LC50) : 1,0 mg/l
Species: Rainbow trout
Acute toxicity
Exposure time: 96 h
Method: OECD Test Guideline 203
- Toxicity to fish (NOEC) : 0,041 mg/l
Species: Rainbow trout
Chronic toxicity
Exposure time: 21 d
Method: OECD 204
- Toxicity to daphnia (EC50) : 0,094 mg/l
Species: Daphnia magna
Immobilization
Exposure time: 48 h
Method: EPA-FIFRA
- Toxicity to daphnia (NOEC) : 0,010 mg/l
Species: Daphnia magna
Reproduction Test
Exposure time: 21 d
Method: OECD 211
- Toxicity to algae (EbC50) : 0,026 mg/l
Species: Selenastrum sp.
Growth inhibition
Exposure time: 96 h
Method: OECD Test Guideline 201

Safety Data Sheet

Bardac 22

Version: 29.12.2003 / EN

Toxicity to bacteria (EC10) : 0,13 mg/l
Species: Pseudomonas sp.
Growth inhibition
Exposure time: 16 h
Method: DIN 38412 Part 8

Toxicity to bacteria (EC50) : 11 mg/l
Species: activated sludge
Respiration inhibition
Exposure time: 3 h
Method: OECD 209

Toxicity to soil dwelling organisms (NOEC) : \geq 1000 mg/kg
Species: earthworm
Acute toxicity
Exposure time: 14 d
Method: OECD 207

Persistence and degradability

Stability in water : Abiotic degradation
hydrolytically stable
Method: EPA-FIFRA

Biodegradability : OECD Confirmatory Test: 91 %
Testing period: 24 - 70 d
Method: OECD 303 A

Zahn-Wellens Test: 87 - 94 %
Testing period: 28 d
Method: OECD 302 B

Die-Away Test: 90 %
Testing period: 28 d
Method: OECD 301 A

CO₂ Evolution: 81 %
Testing period: 28 d
Method: US-EPA

Bioaccumulative potential

Bioaccumulation : Does not bioaccumulate.
Bioconcentration factor (BCF): 81,00
Species: Bluegill sunfish
Exposure time: 46 d
Method: EPA-FIFRA

Safety Data Sheet

Bardac 22

Version: 29.12.2003 / EN

13. Disposal considerations

- Waste from residues : Must be incinerated in a suitable incineration plant holding a permit delivered by the competent authorities.
- Contaminated packaging : Where possible recycling is preferred to disposal or incineration.

Safety Data Sheet

Bardac 22

Version: 29.12.2003 / EN

14. Transport information

ADR	:	Class: 8 Packaging group: II Classification Code: CF1 Labels: Corrosive No. 8 Flammable Liquid No. 3
UN/ID No. Proper shipping name	:	Risk No. : 83 2920 Corrosive liquid, flammable, n.o.s. (Didecyldimethylammoniumchloride; Isopropanol)
RID	:	Class: 8 Packaging group: II Classification Code: CF1 Labels: Corrosive No. 8 Flammable Liquid No. 3
UN/ID No. Proper shipping name	:	Risk No. : 83 2920 Corrosive liquid, flammable, n.o.s. (Didecyldimethylammoniumchloride; Isopropanol)
IATA Cargo	:	Class: 8 Packaging group: II Labels: Corrosive No. 8 Flammable Liquid No. 3 Cargo Aircraft Only
UN/ID No. Proper shipping name	:	Packing instruction (cargo aircraft): 812 2920 Corrosive liquid, flammable, n.o.s. (Didecyldimethylammoniumchloride; Isopropanol)
IATA Passenger	:	Class: 8 Packaging group: II Labels: Corrosive No. 8 Flammable Liquid No. 3
UN/ID No. Proper shipping name	:	Packing instruction (passenger aircraft): 808 2920 Corrosive liquid, flammable, n.o.s. (Didecyldimethylammoniumchloride; Isopropanol)
IMDG-Code	:	Class: 8 Packaging group: II Labels: Corrosive No. 8 Flammable Liquid No. 3 EmS: 8-15
UN/ID No.	:	Marine pollutant: yes 2920

Safety Data Sheet

Bardac 22

Version: 29.12.2003 / EN

Proper shipping name : Corrosive liquid, flammable, n.o.s.
(Didecyldimethylammoniumchloride; Isopropanol)

15. Regulatory information

Additional advice : Classification and labelling according to Directive 1999/45/EC.

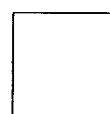
Symbol(s) :



Corrosive



Dangerous for the environment



R-phrase(s)

R10: Flammable.
R22: Harmful if swallowed.
R34: Causes burns.
R67: Vapours may cause drowsiness and dizziness.
R50: Very toxic to aquatic organisms.

S-phrase(s)

S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S28: After contact with skin, wash immediately with plenty of soap and water.
S36/37/39: Wear suitable protective clothing, gloves and eye/face protection.
S45: In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).
S61: Avoid release to the environment. Refer to special instructions/safety data sheets.

National legislation

Water contaminating class (Germany) : WGK 2: water endangering

Poison class (Switzerland) : GK 3

16. Other information

Inventories : Swiss Poisons List 2 (Public Products): yes, G-258708

Other regulations : The components of this product are reported in the following inventories: EINECS, TSCA.

Do not flush into surface water or sanitary sewer system.

Safety Data Sheet

Bardac 22

Version: 29.12.2003 / EN

R-phrase(s)

R11	: Highly flammable.
R22	: Harmful if swallowed.
R34	: Causes burns.
R36	: Irritating to eyes.
R67	: Vapours may cause drowsiness and dizziness.

Changes since the last version will be highlighted in the margin. This version replaces all previous versions.

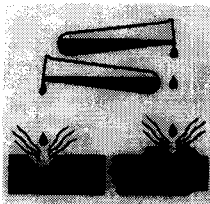
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

A.6. Label Bardac-22

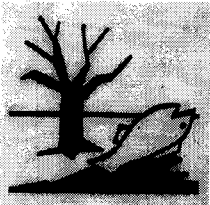
Lonza Ltd, CH-4002 Basel

Emergency Phone +41 61 313 94 94 [24 h]

Lonza



Ätzend
Ætsende
Corrosive
Corrosif
Corrosivo
Corrosief
Διαβρωτικό
Etsende
Vådligt



Peligroso para el medio ambiente
Miljøfarlig
Umweltgefährlich
Dangerous for the environment
Dangereux pour l'environnement
Pericoloso per l'ambiente
Milieugevaarlijk
Perigoso para o ambiente
Επικίνδυνο για το περιβάλλον

Bardac-22

N,N-Didecyl-N,N-dimethylammonium chloride

ES Inflamable. Nocivo por ingestión. Provoca quemaduras. La inhalación de vapores puede provocar somnolencia y vértigo. Muy tóxico para los organismos acuáticos. En caso de contacto con los ojos, lávenlos inmediata y abundantemente con agua y acúdase a un médico. En caso de contacto con la piel, lávese inmediata y abundantemente con agua y jabón. Usen indumentaria y guantes adecuados y protección para los ojos/la cara. In caso de accidente o malestar, acúdase inmediatamente al médico (si es posible, muéstrele le etiqueta). Evítase su liberación al medio ambiente. Recábense instrucciones específicas de la ficha de datos de seguridad.

DA Brandfarlig. Farlig ved indtagelse. Ætsningsfare. Dampene kan give sløvhed og svimmelhed. Meget giftig for organismer, der lever i vand. Kommer stoffet i øjnene, skylles straks med vand og læge kontaktes. Kommer stof på huden vaskes straks med store mængder vand og sæbe. Brug særligt arbejdstøj, egnede beskyttelseshandsker og briller/ansigtsskærm. Ved ulykkestilfælde eller ved ildebefindende er omgående lægebehandling nødvendig; vis etiketten, hvis det er muligt. Undgå udledning til miljøet. Se særlig vifjedning/leverandørbrugsanvisning.

DE Entzündlich. Gesundheitsschädlich beim Verschlucken. Verursacht Verätzungen. Dämpfe können Schläfrigkeit und Benommenheit verursachen. Sehr giftig für Wasserorganismen. Bei Berührung mit den Augen gründlich mit Wasser abspülen und Arzt konsultieren. Bei Berührung mit der Haut sofort abwaschen mit viel Wasser und Seife. Bei der Arbeit geeignete Schutzkleidung, Schutzhandschuhe und Schutzbrille / Gesichtsschutz tragen. Freisetzung in die Umwelt vermeiden. Besondere Anweisungen einholen/Sicherheitsdatenblatt zu Rate ziehen.

EN Flammable. Harmful if swallowed. Causes burns. Vapours may cause drowsiness and dizziness. Very toxic to aquatic organisms. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water and soap. Wear suitable protective clothing, gloves and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Avoid release to the environment. Refer to special instructions/safety data sheets.

FR Inflammable. Nocif en cas d'ingestion. Provoque des brûlures. L'inhalation de vapeurs peut provoquer somnolence et vertiges. Très toxique pour les organismes aquatiques. En cas de contact avec les yeux, laver immédiatement et abondamment avec de l'eau et consulter un spécialiste. Après contact avec la peau, se laver immédiatement et abondamment avec eau et savon. Porter un vêtement de protection approprié, des gants et un appareil de protection des yeux/du visage. En cas d'accident ou de malaise, consulter immédiatement un médecin (si possible, lui montrer l'étiquette). Éviter le rejet dans l'environnement. Consulter les instructions spéciales/la fiche de données de sécurité.

IT Infiammabile. Nocivo per ingestione. Provoca ustioni. L'inhalazione dei vapori può provocare sonnolenza e vertigini. Altamente tossico per gli organismi acquatici. In caso di contatto con gli occhi, lavare immediatamente e abbondantemente con acqua e consultare un medico. In caso di contatto con la pelle lavarsi immediatamente ed abbondantemente con acqua e sapone. Usare indumenti protettivi e guanti adatti e proteggersi gli occhi/la faccia. In caso di incidente o di malessere consultare immediatamente il medico (se possibile, mostrargli l'etichetta). Non disperdere nell'ambiente. Riferirsi alle istruzioni speciali/schede informative in materia di sicurezza.

NL Ontvlambaar. Schadelijk bij opname door de mond. Veroorzaakt brandwonden. Dampen kunnen slaperigheid en duizeligheid veroorzaken. Zeer vergiftig voor in het water levende organismen. Bij aanraking met de ogen onmiddellijk met overvloedig water afspoelen en deskundig medisch advies inwinnen. Na aanraking met de huid onmiddellijk wassen met veel water en zeep. Drag geschikte beschermende kleding, handschoenen en een beschermingsmiddel voor de ogen/voor het gezicht. Bij een ongeval of indien men zich onwel voelt, onmiddellijk een arts raadplegen (indien mogelijk hem dit etiket tonen). Voorkom lozing in het milieu. Vraag om speciale instructies/veiligheidskaart.

UN 2920

Symbol: C, R: 10, 22, 34, 50, 67 S: 26, 28, 36/37/39, 45, 61 Cas No. 7173-51-5 CIS 1043.40

B. Registrations

B.1. Switzerland

- B.1.1 Bundesamt für Gesundheit (Federal Health Ministry), Bern.
Decree on the admission to the Toxicity List, December 10, 2001. Classification:
Category 4 BAGT No. 23917
- B.1.2 Eidgenössische Forschungsanstalt für Milchwirtschaft (Federal Research Institute for the Milk Industry, Liebefeld, Bern. Disinfection of cleaned equipment, vessels and bottles in milk processing plants. Application group B/1.
Use concentration 0.1 %. Registration issued April 25, 1977
- B.1.3 Interkantonale Kontrollstelle für Heilmittel IKS; (Interstate Board of Control for Pharmaceuticals), Bern IKS confirmation of December 19, 1980
Bardac-22 is accepted as active ingredient in pharmaceuticals to combat athlete's foot.

B.2. USA

- B.2.1 EPA Environment Protecting Agency
USDA Registration number No. 6836-18
Date of registration February 14, 1970
- B.2.2 FDA, Food and Drug Administration
No rinse claim
Date of registration August 4, 1976 § 121.2547
300 ppm Bardac-22 may be used in no rinse sanitizer solution on food processing equipment and utensils. This solution may be used on food contact surfaces in public eating places.

B.3. Germany

- B.3.1 Hygiene Institut des Ruhrgebiets, (Hygiene Institute of the Ruhr area)
Gelsenkirchen
Prof. Dr. Primavesi, January 19, 1981
Safety certification according to § 38 of the Mining Decree of Coal Mines in the administrative district, Dortmund, dated February 20, 1970
The certificate attests that Bardac-22 is no hazard to health if applied according to use recommendations.
- B.3.2 BgVV (former **bga**), Berlin
Registration number 6595.00.00
Date of registration: January 28, 1986
Bardac-22 is registered under the name of Azolat® as a drug to prevent athlete's foot at a use dilution of 0.25 %
- B.3.3 BgVV (former **bga**), Berlin
Recommendation XIV (Dispersions for plastic material)
Bardac-22 can be utilized in concentrations of up to 100 ppm max. (as is, calculated on weight of plastic material) for the treatment of utensils which come in contact with food.
Accepted maximum amount of Bardac-22 = 1000 ppm (0,1%)
- B.3.4 BgVV (former **bga**), Berlin
Recommendation XXXVI (36th) for the health related evaluation of plastics according to the Foodstuff and Consumer Products Law.
Bardac-22 may be used safely as a slimicide for the production of papers and boards intended for food packing at a concentration up to 0.05% (w/w) calculated on dry fibrous material.

B.4. Netherlands

- B.4.1 College voor de Toelating van Bestrijdingsmiddelen (CTB), Wageningen
Ministerie van WVC (Welzijn, Volksgezondheid, Cultuur)
No. of registration: 7086 N, valid until October 2001

<u>Registered as disinfectant for</u>	<u>Concentration/contact time</u>
-hard surfaces in hospitals and food industry	0.08%/5 min.
-wooden crates and empty storage rooms for -fruits and potatoes	0.15 - 0.3 %
-equipment for digging up, transportation and processing for seed potatoes	0.3 %
-recirculating water treatment	0.001 %
-paper/cardboard additive systems	400-800 ml Bardac-22/MT of paper 0.02 - 0.04 %
maintenance concentration	0.04 - 0.4 %
-algicide -horticulture	0.3 - 0.5 %
-algicide domestic	0.5 %

B.5. France

- B.5.1 Journal officiel de la République Française (Federal register of the French Republic)
January 19, 1980 N.C. 789
Bardac-22 can be used in cleaning products for materials which might come in contact with food.
- B.5.2 Ministère de la Solidarité, de la Santé et de la Protection Sociale, Paris
February 15, 1990
Bardac-22 has been approved by the "Conseil Supérieur d'Hygiène Publique de France" (French Supreme Council of Public Health) as disinfectant to combat athlete's foot in swimming pools.
- B.5.3 Ministère de l'Economie, des Finances et du Budget Conseil Supérieur d'Hygiène Publique de France, Paris
February 14, 1991
Bardac-22 (DDCA) has been approved for cleaning and disinfection of equipment in the field of milk industry (incl. fermentation).

B.6. Austria

- B.6.1 Austrian list of toxic substances
Reclassification of Bardac-22
October 17, 1989
Bardac-22 = X_n (low toxicity)

B.7. Spain

- B.7.1 Ministerio de Sanidad y Consumo, Dirección General de Salud Pública
Date of registration: April 30, 1993
Registration number: 92-20-00318-HA
Application area: Disinfectant for
Collectivities
Food industry
Swimming pools
- B.7.2 Ministerio de Agricultura Pesca y Alimentación, Dirección Gral. de Sanidad de la Producción Agraria. Sub. Gral. de Sanidad Animal.
Date of registration: August 13, 1993
Registration number: P-38
Application area: Disinfectant for
Veterinary field

- B.7.3** Ministerio de Sanidad y Consumo, Dirección General de Salud Pública
Date of registration: November 22, 1993
Registration number: 93-00.00612-HA
Application area: Disinfectant for
Babys' bottles
- B.7.4** Ministerio de Agricultura Pesca y Alimentación, Secretaria General de
Producciones y Mercados Agrarios, Dirección Gral. de Sanidad de la Producción
Agraria.Sub.Gral. de Sandidad Vegetal.
Date of registration: December 14, 1994
Registration number: 19685/96
Application area: Preservative for
Wood treatment formulations

B.8. Sweden

- B.8.1** In order to have Bardac-22 registered as a biocide, the necessary file has been submitted to the authorities.

B.9. Finland

- B.9.1** In order to have Bardac-22 registered as a biocide, the necessary file has been submitted to the authorities.

C. Microbiological Testresults

C.1. Bacteria

C.1.1. USA

C.1.1.1.

Biotech Control Laboratories Inc. Waterford, N.Y.

Report 2670

August 25, 1970

Test method: API-38 test

Product: Bardac-22

Test organisms

Pseudomonas fluorescens

Bacillus cereus

Desulfovibrio desulfuricans

effective concentration

2.0 ppm

2.0 ppm

7.5 ppm

C.1.1.2.

Biotech Control Laboratories Inc. Waterford, N.Y.

Report L-2872

May 4, 1972

Test method: Germicidal and Detergent Sanitizers Method (in presence of hard water)

Product: Bardac-22 at 150 ppm

Test organisms

Staphylococcus aureus ATCC 6538

Escherichia coli ATCC 11229

Germ reduction

99.9999 %

99.9992 %

C.1.1.3.

Biotech Control Laboratories Inc. Waterford, N.Y.

Report BCI-0670 (1970)

Test method: Use dilution test

Product: Bardac-22

Test organisms

Staphylococcus aureus ATCC 6538

Salmonella choleraesuis ATCC 10708

Pseudomonas aeruginosa ATCC 15442

effective concentration

300 ppm

300 ppm

500 ppm

C.1.1.4.

Biotech Control Laboratories Inc. Waterford, N.Y.

Report BCI-0770

Test method: Phenol coefficient

Product: Bardac-22

Test organisms

Staphylococcus aureus ATCC 6538

Salmonella typhi ATCC 6539

Phenol Coefficient

1000

1000

C.1.1.5.

Biotech Control Laboratories Inc. Waterford, N.Y.

Report L-6172

September 13, 1972

Test method: Agar plate ATCC 90-1965T

Product: Bardac-22

Results:

Bardac-22 at 200 ppm OWF at a dilution 1:5 of cloth to water demonstrates residual bacteriostatic activity versus:

Test organisms

Staphylococcus aureus ATCC 6538 and

Klebsiella pneumoniae ATCC 4532

C.1.1.6.
 Biotech Control Laboratories Inc. Waterford, N.Y.
 Report L-6172a
 September 6, 1972
 Test method: Agar plate AATCC 90-1965T (Overlay technique)
 Product: Bardac-22
 Results:
 Bardac-22 at 200 ppm OWF at a dilution 1:5 of cloth to water
 demonstrates residual bacteriostatic activity versus:
 Test organisms
 Staphylococcus aureus ATCC 6538 and
 Klebsiella pneumoniae ATCC 4532

C.1.1.7.
 Biotech Control Laboratories Inc. Waterford, N.Y.
 Report L-9672
 November 27, 1972
 Test method: AATCC 100-1965T
 Product Bardac-22
 Efficacy at 300 ppm OWF (= on weight of dry fabric)
 Test organisms

	Killing rate
Staphylococcus aureus ATCC 6538	99.9 %
Klebsiella pneumoniae ATCC 4352	99.9 %

C.1.1.8.
 Biotech Control Laboratories Inc. Waterford, N.Y.
 Report L-9772
 December 6, 1972
 Test method: Modified Petrocci & Clarke method for laundry activities,
 J.A.O.A.C.
 Product: Bardac-22
 Efficacy at 660 ppm OWF (on weight of dry fabric)
 Test organisms

	Killing rate
Staphylococcus aureus ATCC 6538	99,98 %
Klebsiella pneumoniae ATCC 4352	99,92 %

C.1.1.9.
 Biotech Control Laboratories Inc. Waterford, N.Y.
 Report L-16074
 December 3, 1974
 Product: Bardac -22
 Test method: Minimum inhibitory concentration test (static)
 Test organisms

Leuconostoc mesenteroides ATCC 10830a:	effective concentration
	0.75 ppm
Test method: Killing dilution test (cidal) Test organisms	
Leuconostoc mesenteroides ATCC 10830a:	effective concentration
	1-2 ppm

C.1.1.10.
 Biotech Control Laboratories Inc. Waterford, N.Y.
 Report L-2773
 April 10, 1973
 Test method: Agar plate AATCC 90-1965 T
 Product: Mixture of Bardac-22 and Bardac-LF
 Test organisms
 Klebsiella pneumoniae ATCC 4352
 Effective concentration

Moderate activity	100 ppm
Complete inhibition	175 ppm

C.1.1.11.

LONZA Inc. Fair Lawn/ Report Technical Service Laboratories

February 9, 1979

Test method: As described in the report

Product: Bardac-22

Test organisms

Legionella pneumophilia

Effective concentration

32 ppm

16 ppm

Contact time

15 min.

2 hrs

C.1.1.12.

Southern Research Institute, Birmingham AL, USA

Report 7898-4-93-1

July 8, 1993

Test method: AOAC Use-Dilution Test

Efficacy of quaternaries in presence of Vibrio cholerae

Effective concentration (expressed as Bardac-22)

420 ppm 10 min.

Contact time

C.1.2. Germany

C.1.2.1.

Institute of Hygiene, Mainz

Prof.Dr.J.Borneff

January 12, 1977

Report and investigation to assess the influence of standardised hard water

Test method: DGHM

Product: Bardac-22

Hard water has no influence on the microbiological efficacy.

C.1.2.2.

Technical University, Munich, Prof.Mändl

December 8, 1977

Report and certificate on the suitability for use in breweries.

Product: Bardac-22

Effective concentration

0.05 - 0.1 %

0.1 %

Application area

normal disinfection

disinfection with short contact time

C.1.2.3.

Prof.Dr.med R.Schubert, Frankfurt/M

May 20, 1988

Report and certificate on biocidal activity.

Test method: DGHM, qualitative suspension test

Product: Bardac-22

Test organisms:

Listeria monocytogenes Typ 4

Listeria monocytogenes Typ 4

effective concentration/contact time

0.05% / 5 min.

0.01% / 1 hr

C.1.2.4.

Prof. Dr. med. J. Borneff, Mainz

June 21, 1980

Report and certificate on comparative activity of Bardac-22 and other Dialkyl-Quats and Benzalkonium compounds:

Test method: DGHM quantitative suspension and surface test

Test organisms:

Staphylococcus aureus

Pseudomonas aeruginosa

Candida albicans

Result: In both tests Dialkyl-Quats and in particular Bardac-22 achieved the best results.

C.1.2.5.

Prof. Dr. med R. Schubert, Frankfurt/M

May 17, 1985

Report and certificate of fungicidal activity (to prevent athlete's foot on skin).

Test method: DGHM

Species: guinea pigs

Product: Bardac-22

Test organisms

Microsporon canis

Trichophyton sp.

effective concentration

0.25 %

0.25 %

C.1.2.6.

Prof. Dr. med R. Schubert, Frankfurt/M

October 7, 1985

Report and certificate on fungicidal activity (to prevent athlete's foot).

Test method: DGHM surface test. (ceramic tiles)

Product: Bardac-22

Test organisms:

Microsporon gypseum

Trichophyton mentagrophytes ATCC 9533

effective concentration

0.25 % / 1 hr

0.25 % / 1 hr

C.1.2.7.

Prof. Dr. med R. Schubert, Frankfurt/M

December 1, 1989

Report and certificate on fungicidal activity on untreated wood.

Test method: DGHM surface test.

Product: Bardac-22

Test organisms:

effective concentration/contact time

Candida albicans ATCC 10231

0.5 % / 1 hr

0.25 % / 4 hrs

Trichophyton mentagrophytes ATCC 9533

0.5 % / 1 hr

0.25 % / 4 hrs

C.1.2.8.

Prof. Dr. med R. Schubert, Frankfurt/M

January 28, 1989

Report and certificate on biocidal activity.

Test method: Standard DGHM VII^m list.

Test organisms

Staphylococcus aureus ATCC 6538

Escherichia coli ATCC 11229

Pseudomonas aeruginosa ATCC 15442

Proteus mirabilis ATCC 14153

Candida albicans ATCC 10231

effective concentration/contact time

0.25 % / 4 hrs

0.5 % / 1hr

0.25 % / 4 hrs

0.5 % / 1hr

0.25 % / 4 hrs

0.5 % / 1hr

0.25 % / 4 hrs

0.5 % / 1hr

0.25 % / 4 hrs

0.5 % / 1hr

C.1.2.9.

Prof. Dr. med R. Schubert, Frankfurt/M

November 3, 1997

Report and certificate on the efficacy of Bardac-22 against **MRSA** (multiresistant

Staphylococcus aureus)

Method: DGHM, quantitative suspension test

Test organisms:

Staphylococcus aureus MR 1150 et. al.

effective concentration/contact time

0.005 % / 5 min.

C.1.3. Switzerland

C.1.3.1.

Eidgenössische Forschungsanstalt für Milchwirtschaft (Federal Research Institute for the Milk Industry, Liebefeld, Bern)

April 27, 1977

Disinfection of cleaned equipment, vessels and bottles in milk processing plants.

Product: Bardac-22

Effective concentration 0.1 %.

C.1.4. France

C.1.4.1.

Laboratoire National de la Santé, Montpellier (National Laboratory of Health)

October 24, 1977

Bactericidal activity

Test method AFNOR NF T 72-151

Product: Bardac-22

Test organisms:

	effective concentration
<i>Pseudomonas aeruginosa</i> IPP A 22	0.025 %
<i>Escherichia coli</i> ATCC 10536	0.006 %
<i>Staphylococcus aureus</i> ATCC 9144	0.025 %
<i>Streptococcus faecalis</i> ATCC 10541	0.0125 %
<i>Mycobacterium smegmatis</i> IPP 7326	0.025 %

C.1.4.2.

Université de Paris-Sud, Châtenay-Malabry (University of Paris-South)

Prof. German

December 1, 1977

Bactericidal, fungicidal and virucidal activity

Test method: AFNOR NF-T 72-150

Product: Bardac-22

Test organisms (Bacteria)

	effective concentration
<i>Pseudomonas aeruginosa</i> IPP 22	0.01 %
<i>Escherichia coli</i> IPP 54.127	0.01 %
<i>Staphylococcus aureus</i> ATCC 9144	0.01 %
<i>Streptococcus faecalis</i> ATCC 10541	0.01 %
<i>Mycobacterium smegmatis</i> IPP 7326	0.01 %

C.1.4.3.

Laboratoire Central de l'alimentation F-Charenton (Central Food Lab)

B.de Nazella, Report 60125 on bactericidal activity

June 7, 1977

Test method AFNOR N FT 72-150

Product: Bardac-22

Test organisms

	effective concentration
<i>Pseudomonas fluorescens</i>	0.05 %
<i>Escherichia coli</i> IPP 54.127	0.05 %
<i>Staphylococcus aureus</i> IPP 53154	0.05 %
<i>Streptococcus faecalis</i> IPP 5855	0.05 %
<i>Mycobacterium smegmatis</i> IPP 7326	0.05 %

C.1.4.4.

LABOREC, F- Levallois-Perret

June 18, 1982

Report on bactericidal activity

Product: Bardac-22

Test organisms:

Pseudomonas aeruginosa CNCM A 22
Escherichia coli CNCM 54127
Staphylococcus aureus CNCM 53154
Streptococcus faecalis CNCM 5855
Mycobacterium smegmatis CNCM 7326

Test method

	effective concentration
AFNOR N FT 72-150	0.025 %
AFNOR N FT 72-151	0.0125 %
AFNOR N FT 72-171	1.2 %

C.1.4.5.

Université de Nancy F-Nancy

Hubert Vannesson, Thesis in odontological sciences, 1984

Tolerance of Bardac-22 in presence of anions, hard water. and organic matter.

Results:

In presence of 300 ppm Na-Laurylsulfate, *Staphylococcus aureus* is killed by 400 ppm Bardac-22. (Conventional quaternaries do not pass this test).

In presence of 1500 ppm CaCO₃ *Escherichia coli* is reduced within 30 seconds from 10⁶ to 10¹ by 200 ppm Bardac-22.

In contact with organic matter Bardac-22 shows three times higher activity than conventional quaternaries.

The bactericidal efficacy is maintained even in presence of 5-10 % of proteines (blood serum)

C.1.4.6.

Institut de Recherche Microbiologique, F-Mitry-Mory

Dr. A. Chantefort, February 6, 1990

Report on bactericidal activity

Product: Bardac-22

Test method AFNOR N FT 72-190 (spectre 5)

Test organisms	effective concentration/contact time	
<i>Pseudomonas aeruginosa</i> CIP A 22	1.0 %	60 min
<i>Escherichia coli</i> CIP 54127	1.0 %	60 min
<i>Staphylococcus aureus</i> CIP 53154	1.0 %	15 min
<i>Enterococcus faecium</i> CIP 5855	1.0 %	15 min
<i>Mycobacterium smegmatis</i> CIP 7326	1.0 %	60 min

C.1.4.7.

Laboratoire d'Hygiène de la Ville de Paris -F 75013 Paris

September 27, 1991

Report an bactericidal activity

Test method AFNOR N FT 72-171 (hard water 30° French hardness)

Product: Bardac-22

Test organisms	effective concentration
<i>Pseudomonas aeruginosa</i> CIP A 22	0.05 %

C.1.5. Italy

C.1.5.1.

Università di Milano, Prof. Antonio Fesce

January 20, 1978

Bacteriostatic activity,

Test method: Suspension test

Product: Bardac-22

Test organisms	effective concentration
<i>Escherichia coli</i> ATCC 10536	25 ppm
<i>Salmonella paratyphi</i> A	50 ppm
<i>Proteus vulgaris</i> ATCC 881	20 ppm
<i>Shigella sonnei</i> ATCC 9290	10 ppm
<i>Klebsiella pneumoniae</i> ATCC 10031	20 ppm
<i>Streptococcus faecalis</i> ATCC 10541	2.5 ppm
<i>Streptococcus pneumoniae</i> Scervo III	2.5 ppm
<i>Streptococcus pyogenes</i> A	2.5 ppm
<i>Staphylococcus aureus</i> I.S.M:	2.5 ppm
<i>Sarcina lutea</i> ATCC 9341	0.625 ppm
<i>Corynebacterium diphtheriae</i> ATCC 8032	2.5 ppm
<i>Brucella abortus</i> ATCC 9153	0.625 ppm
<i>Lactobacillus casei</i> ATCC 7469	0.625 ppm
<i>Bacillus subtilis</i> ATCC 6633	0.03125 ppm
<i>Pseudomonas aeruginosa</i> ATCC 10145	20 ppm
<i>Candida albicans</i> ATCC 10231	12.5 ppm
<i>Nocardia asteroides</i> CBS	3.125 ppm
<i>Aspergillus niger</i> ISM	1000 ppm
<i>Penicillium</i> sp.	12.5 ppm
<i>Trichophyton mentragrophytes</i> ATCC 8757	3.125 ppm

Test organisms	effective concentration/contact time
<i>Staphylococcus aureus</i> I.S.M.	5 ppm 1 min.
<i>Escherichia coli</i> ATCC 10536	25 ppm 1 min.
<i>Streptococcus faecalis</i>	10 ppm 1 min.
<i>Corynebacterium diphtheriae</i> ATCC 8032	5 ppm 1 min.
<i>Pseudomonas aeruginosa</i> ATCC 10145	100 ppm 1 min.

Bactericidal activity:

Test method: G..E.Davis

Product: Bardac-22

C.1.5.2.

Università Cattolica del Sacro Cuore, I-29100 Piacenza

Prof. Vittorio Bottazzi

October 25, 1978

Report on bactericidal activity

Product: Bardac-22

Test conditions:

Temperature 45°C and 20°C

pH 6.5 and 5.0

Organic matter 0, 0.5 and 2.0 %

Test organisms

Escherichia coli ATCC 9637

Bacillus strearothermophilus NIDR C 953

Micrococcus lysodeiticus IMPC

Streptococcus faecium

Pseudomonas fluorescens IMPC

effective concentration/contact time

0.05 %/ 1 min.

0.05 %/ 1 min.

0.05 %/ 1 min.

0.05 %/ 1 min.

0.05 %/ 1 min.

C.1.5.3.

Bio Lab, Centro di analisi e ricerche biologiche, I-Milano

Dr.A.Salvi, Dr.L.Magi

September 24, 1986

Report on bactericidal activity

Test method AFNOR N FT 72-151

Product: Bardac-22

Test organisms

Pseudomonas aeruginosa CNCM A 22

Escherichia coli ATCC 10536

Staphylococcus aureus ATCC 9 144

Streptococcus faecalis ATCC 10 541

Mycobacterium smegmatis CNCM 7 326

effective concentration

750 ppm

750 ppm

750 ppm

750 ppm

750 ppm

C.1.6. Belgium

C.1.6.1.

Laboratorium Voor Hygiene, Katholieke Universiteit (Laboratory for Hygiene, Catholic University), B-Leuven

Prof. Dr. H.van de Voorde and Dr. G. Reybrouck, Report on microbicidal activity

November 28, 1975

Method; Kelsey-Sykes Test

Product: Bardac-22

Test organisms

Staphylococcus aureus NCTC 4163

Pseudomonas aeruginosa NCTC 6749

Escherichia coli NCTC 8196

effective concentration

0.05 %

0.05 %

0.05 %

C.1.6.2.

Laboratorium Voor Hygiene, Katholieke Universiteit, (Laboratory for Hygiene, Catholic University) B-Leuven

Prof. Dr. H.van de Voorde and Dr. G. Reybrouck

December 10, 1975

Report on microbicidal activity according to the standard required by the Dutch commission for Phytopharmacy

Product: Bardac-22

Test method: 5-5-5

Test organisms

Staphylococcus aureus ATCC 6538

Pseudomonas aeruginosa ATCC 15442

effective concentration

0.05 %

0.05 %

C.1.7. Netherlands

C.1.7.1.

Laboratorium Voor Hygiene, Katholieke Universiteit, (Laboratory for Hygiene, Catholic University) B-Leuven

Prof. Dr. H. van de Voorde and Dr. G. Reybrouck

December 10, 1975

Report on microbicidal activity according to the standard required by the Dutch commission for Phytopharmacy

Product: Bardac-22

Test method; 5-5-5

Test organisms

effective concentration

Staphylococcus aureus ATCC 6538

0.05 %

Pseudomonas aeruginosa ATCC 15442

0.05 %

C.1.8. United Kingdom

C.1.8.1.

Disinfection Reference Laboratory

November 28, 1977

Microbicidal activity under clean and dirty test conditions

Test method: Kelsey-Sykes Capacity Test

Product: Bardac-22

Test conditions: CLEAN

Test organisms

effective concentration

Pseudomonas aeruginosa NCTC 6749

0.05 %

Test conditions: DIRTY

Test organisms

effective concentration

Pseudomonas aeruginosa NCTC 6749

0.7 %

C.1.8.2.

Laboratory of the Government Chemist, GB-London

January 31, 1979

Microbicidal activity of different quaternaries under clean and dirty test conditions

Test method: Kelsey Sykes Capacity Test

Results expressed on Bardac-22

Test conditions: CLEAN

Test organism

effective concentration

Pseudomonas aeruginosa NCTC 6749

0.075 %

Test conditions: DIRTY

Test organism

effective concentration

Pseudomonas aeruginosa NCTC 6749

0.7 %

C.1.8.3

Analytical Consulting and Research Chemists, Microbiologists.

May 30, 1987

Dilution test

Test method: BS 6471

effective concentration

Bardac-22

96 ppm

C.1.8.4

Healthcare Science Ltd., Hitchin, Herts.

February 24, 1997

Efficacy test against E.coli 0157

Test method: BS 6471:1984 in presence of 5% horse serum

Product: Bardac-2270-E

effective concentration

Result

175 ppm

log 4 reduction after 10 min.

C.1.8.5.
IMSL, Industrial Microbiological Services Ltd., Oxford
June 16, 1999
Activity test against Legionella pneumophila
Test method: prEN 13 623
Product: Bardac-2240
Result
Contact time

effective concentration
50 ppm
30 min

C.1.9. Austria

C.1.9.1.
Prof. Dr. med J.R. Möse, Graz
March 17, 1986
Report and certificate on biocidal activity
Method: Standard DGHM VII list.
Product: Bardac-22

Test organisms	effective concentration/contact time	
Staphylococcus aureus ATCC 6538	0.25 % / 4 hrs	0.5 % / 1hr
Escherichia coli ATCC 11229	0.25 % / 4 hrs	0.5 % / 1hr
Pseudomonas aeruginosa ATCC 15442	0.25 % / 4 hrs	0.5 % / 1hr
Proteus mirabilis ATCC 14153	0.25 % / 4 hrs	0.5 % / 1hr
Candida albicans ATCC 10231	0.25 % / 4 hrs	0.5 % / 1hr

C.2.Fungi

C.2.1.

Biotech Control Laboratories Inc. USA-Waterford N.Y.

Report BCI-0771

April 27, 1971

Test method: Fabric Mildew Fungistatic Test Method

Test organisms:

Aspergillus niger ATCC 6275

Penicillium glaucum (USDA)

Results:

No growth after 4 weeks on fabric test pieces treated with 660 ppm Bardac-22

C.2.2.

Biotech Control Laboratories Inc. USA-Waterford N.Y.

Report L-5572

December 15, 1972

Test method USDA Hard Surface Mildew Fungistatic Test Method (Ceramic tiles)

Test organisms: effective concentration Bardac-22

Aspergillus niger ATCC 6275 1000 ppm

C.2.3.

Biotech Control Laboratories Inc. USA-Waterford N.Y.

Report L-5872

October 2, 1972

Test method: A.O.A.C. Fungicidal Method

Test organisms:

Trychophyton mentagrophytes (T.interdigitale) NTH 640, ATCC 9533

Product: Bardac-22

Contact time effective concentration

5 min 182 ppm

10 min 166 ppm

15 min 143 ppm

C.2.4.

Université de Paris-Sud, Châtenay-Malabry (University of Paris-South)

Prof. German

December 1, 1977

Report on bactericidal, fungicidal and virucidal activity

Test method: AFNOR NF-T 72-150

Product: Bardac-22

Test organisms (Fungi)

effective concentration

Mycobacterium smegmatis IPP 7326 0.01 %

Candida albicans 0.005 %

C.2.5.

Hygiene Institut der Johannes Gutenberg Universität, D 6500 Mainz

Prof. Dr. med. J. Borneff, Mainz

August 15, 1979

Report and certificate on the activity on untreated wood contaminated with fungi

Method: DGHM

Product: Bardac-22

Test organisms

effective concentration/contact time

Candida albicans ATCC 10231 1.0% 1 hr, 0.5 % 2 hrs

Trichophyton mentagrophytes

1.0% 1 hr, 0.5 % 2 hrs

Microsporum gypseum

1.0% 1 hr, 0.5 % 2 hrs

C.2.6.

Hygiene Institut der Stadt Dortmund, D-4600 Dortmund

Prof. Dr. med. T. Lammers

January 22, 1980

Report and certificate of activity on untreated wood, contaminated with fungi

Method: DGHM

Product: Bardac-22

Test organisms

Candida albicans ATCC 10231

Trichophyton mentagrophytes

Microsporium gypseum

1.0% 1 hr

0.5 % 4 hrs

effective concentration/contact time

C.2.7.

Université de Montpellier, Thesis François Canal

June 5, 1985

Report on fungicidal activity

Test method: AFNOR N FT 72-200

Product: Bardac-22

Test organisms

Aspergillus versicolor CNCM 1187-79

Cladosporium cladosporioides CNCM 1185-79

Penicillium verrucosum CNCM 1186-79

Candida albicans CNCM 1180-79(ATCC 2091)

effective concentration

187.5 ppm

375.0 ppm

375.0 ppm

187.5 ppm

C.2.8.

IRM Institut de Recherche Microbiologique, F-77290 Mitry-Mory

Dr. A. Chantefort

January 23, 1990

Report on fungicidal activity

Test method: AFNOR N FT 72-200 (carrier:glass)

Test organisms

Cladosporium cladosporioides IP 1232 80

Penicillium verrucosum var. *cyclopium* IP 1231 80

Candida albicans IP 1180 79

effective concentration /contact time

1 % 15 min

1 % 15 min

1 % 60 min

C.3. Algae

C.3.1.

Biotech Control Laboratories Inc. USA-Waterford N.Y.

Report BCI-0870

April 20, 1970

Report for algaecidal and algaestatic activities

Test method: Fitzgerald Method

Product: Bardac-22

Test organisms

Chlorella pyrenoidosa No. 2005

Phormidium inundatum No. 1093 (Black Algae)

algaestatic concentration

1.0 ppm

1.0 ppm

algaecidal concentration

2.0 ppm

2.0 ppm

Chlorella pyrenoidosa No. 2005

Phormidium inundatum No. 1093 (Black Algae)

C.3.2.

ETH, Swiss Federal Institute of Technology, Institut for Special Botany

C. Gessler, G. Defago, H. Kern

Publication 1976 Special Edition Nr. 741 from Gas-Wasser-Abwasser

Report for algaestatic and algaecidal activity of Quaternaries

Test method: In vitro - as described in the report

Product Bardac-22

Test organisms

Concentration

algaecidal

algaestatic

Chlorella vulgaris Beyerinck

1.0 ppm

0.5 ppm

Scenedesmus obliquus Kützing

1.0 ppm

0.5 ppm

Phormidium faveolarum

1.0 ppm

0.5 ppm

Phormidium uncinatum

1.0 ppm

0.5 ppm

C.3.3.

ETH Swiss Federal Institute of Technology, Institut for Special Botany

Dr. G. Defago

June 1, 1976

Investigation on the influence of chlorine on the algaestatic activity of

Product: Bardac-22

Test method: On *Chlorella vulgaris* ETHZ 211 and as described in the report

Results:

Bardac-22 in swimming pool waters is not deactivated by chlorine compounds.

C.4. Viruses

C.4.1.

Université de Paris-Sud, Châtenay-Malabry (University of Paris-South)

Prof. German

December 1, 1977

Report on bactericidal, fungicidal and virucidal activity

Test method: AFNOR NF-T 72-150

Product: Bardac-22

Test organisms (Virus)

effective concentration

Virus maladie de Newcastle

0.05 %

Virus vaccinal

0.05 %

Virus grippal PR8

0.05 %

C.4.2.

Tierärztliche Hochschule Hannover, Institut für Virologie (Veterinary University),

D-3000 Hannover

Prof. Dr. B. Liess

November 18, 1977

Report on virucidal activity

Test method: as described in the report

Product: Bardac-22

Test organisms

effective concentration/contact time

Virus IBR/JPV Colorado

1.0 % / 15 min.

C.4.3.

Università di Milano Istituto di Microbiologia e Immunologia (University of

Milan, Institute of Microbiology and Immunology) I-21000 Milano

G.Poli, W.Ponti, R.Micheletti, C.Cantoni

January 30, 1978

Report on virucidal activity of Quaternary Ammonium Compounds

Test method: as described in the report (Titer reduction)

Results of Bardac-22

Test organisms

effective concentration/contact time

Vaccinia virus (Poxvirus)

0.07 % / 1 min.

Influenza virus (Orthomyxovirus)

0.07 % / 1 min.

Adenovirus

0.07 % / 1 min.

Rhabdovirus

0.07 % / 5 min.

Herpesvirus

0.07 % / 5 min.

C.4.4.

Università di Milano Istituto di Microbiologia e Immunologia (University of

Milan, Institute of Microbiology and Immunology) I-21000 Milano

Prof.A.Fesce

January 20, 1978

Report on virucidal activity

Test method: as described in the report

Product: Bardac-22

Test organisms

effective concentration/contact time

Poxvirus WR119-ATCC

5 min.

Herpes virus 1-HF-VR260 ATCC

5 min.

Orthomyxovirus AWSN

5 min.

Adenovirus Type 2

5 min.

Rhabdovirus VSV-1145/67

5 min.

C.4.5.

Ludwig Maximilian Universität München, Max von Pettenkofer Institut für
Hygiene und Medizinische Mikrobiologie D-8000 Munich

Prof.Dr.med.G.Frösner

July 12, 1986

Report on virucidal activity

Test method: as described in the report

Product: Bardac-22

Test organisms

Hepatitis-B-virus

effective concentration/contact time

0.5 % / 30 min.

C.4.6.

Istituto di Virologia, I-00185 Roma

November 26, 1987

Prof.F.Dianzani

Report on virucidal activity

Test method: Guidelines of the Institute as described in the report

Product Bardac-22

Test organisms

Virus HIV-1 (HSV)

effective concentration/contact time

2.0 % / 30 min.

At a concentration of 0.2 % and 30 minutes contact time the product did not completely pass the test requirements.

D.Toxicological Testresults

D.1. Short term toxicology

Reports may be submitted to the authorities upon specified request.

D.2. Long term toxicology

Reports may be submitted to the authorities upon specified request.

D.3. Genetic toxicology

Reports may be submitted to the authorities upon specified request.

E.Special applications

E.4.1.

Continental Oil Company, Ponca City, Oklahoma/USA

L.J.Gawel and R.L.Huddleston

National Meeting in Los Angeles Cal. April 2326,1972

The Biodegradability of low concentrations of certain quaternary ammonium antimicrobials by bacteria.

Results:

Within 48 hours 10 ppm Bardac-22 are biodegraded to more than 90%.

E.4.2.

Johannes Gutenberg Universität, Hygiene Institut, D-6500 Mainz

Prof.Dr.med. J.Borneff

January 12,1977

Investigation on the influence of standardised hard water on the efficacy of Bardac-22.

Test method: DGHM

Results:

Hard water does not hinder the microbiological efficacy of Bardac-22

E.4.3

EAWAG (Swiss Federal Institute of Technology) CH-8600 Dübendorf

Dr.Th.Conrad, Report No. 21-1000

November 6,1975

Respirationtests on Quaternary Ammonium Compounds

The concentrations of Bardac-22 present in waste waters do not cause any measurable influences in the waste water treatment plants.

E.4.4.

Litton Bionetics Kensington, Maryland USA

May 4,1973

Residues of Quaternary Ammonium Compounds on hard surfaces.

Product: Bardac-22

Results:

Residues of 150 ppm Bardac-22 on

Glass 0.07 $\mu\text{g}/\text{cm}^2$ max

China 0.10 $\mu\text{g}/\text{cm}^2$ max

Stainless Steel 0.24 $\mu\text{g}/\text{cm}^2$ max

E.4.5.

Alusuisse CH-Neuhausen

P.Nema

July 25,1980

Investigation on corrosive action of quaternary ammonium compounds

Report FMMC 22/80

Testsolution: 0.1 %, 0.2 %, 0.5 %

Results:

No significant corrosion, and no pitting.

The weight losses were equal or better than those shown by the reference solution (water).

E 4.6.

Centre technique du Bois de l'Ameublement, Paris

Mrs. Dirol, April 23,1985

Bardac-22 was found to be active for the wood treatment.

Test organisms

Sapstain (field test)

effective concentration

0.15 %

E.4.7.

BIOTECH CENTRAL LAB Inc. Waterford N.J. (US)

December 11,1972

Report L-10772

Test method: Preservation of paints (latex paint system)

Product: Bardac-22

Effective concentration: 1.0 %

E.4.8.
PROVINCIALE KEURINGSDIENST VAN WAREN, GRONINGEN (NL)
June 1984
Report 84.40
Residue test
Result
400 ppm of Bardac-22

E.4.9.
EMPA, St.Gallen
Report Dr.E.Graf
July 10, 1987
Test method EN 113
Determination of the active concentration of Bardac-22 in presence of wood destroying basidiomycetes.
Including a washing out step, Bardac-22 shows a fungicidal concentration at 1.4 - 3.1 kg/m³ in presence of all test organisms.

E.4.10.
Technische Universität Berlin
Prof.Dr.K.Rubach
December 1, 1989
Report on migration of Bardac-22.
Test method: Wooden shelves which are used to store cheese were treated with Bardac-22. The study should give information about the migration of Bardac-22 from the wooden shelf into the cheese.
Result:
Bardac-22 does not migrate beyond the exterior plastic rind into the core of the cheese.

E.4.11.
Technical Research Centre of Finland, Espoo
Tapani Suortti
June 1, 1988 and March 29, 1989
Determination of Bardac-22 in beer and wort.
Malt was treated with Bardac-22. Investigations by means of ion-pair HPLC didn't reveal any traces of Bardac-22 neither in beer nor in wort.

E.4.12.
Technische Universität Berlin
Prof.Dr.K.Rubach
September 18, 1995
Report on migration of Bardac-22 into apples stored in plywood .
Test method: Chromatographically.
Result:
In the apple samples examined, and for all storage periods, no Bardac-22 could be found. However, amounts of 91 - 152 ppm Bardac-22 have been detected in the plywood.

E.4.13.
Laboratory Report CSP, Basel
Dr. F. Lichtenberg
October 12, 1995
Report on migration of Bardac-22 from fibre skin (sausage skin, cellulose) into synthetic fats and/or water.
Method: Titration
Result:
No migration of Bardac-22 has been detected. (detection limit 0,5 µg/ dm² skin)

E.4.14.
Laboratory Report CSP, Basel
March 27, 1995
Determination of residues of Quaternary Ammonium Compounds in rinsing water (storage tanks etc).
Product: Bardac-22
Applying a two phase titration as described in the report, residues in rinsing water can be detected down to < 0,01 ppm of Bardac.22,

E.4.15.

Institute Marx, D-Freiburg

July 7, 1997

Evaluation of penetration of Bardac-22 solution into pinewood.

Method: DIN EN 113

Pinewood pieces have been dipped with Bardac-22 solutions at different concentrations and times.

Results:

Bardac-22 concentration %	contact time hours	penetration in mm
0.5	2	0.25 - 0.30
1.0	2	0.40 - 0.50
2.5	2	0.70 - 0.80
5.0	2	0.80 - 0.90
0.5	24	0.40 - 0.50
1.0	24	0.70
2.5	24	0.90 - 1.00
5.0	24	1.10 - 1.20

F. Ecological and Ecotoxicological Data**F.1. Degradation and Transformation****F.1.1. Biodegradation assay equivalent to the modified OECD screening test**

Institute: TNO, Delft, The Netherlands

Date of report: July 25, 1989

Guideline: Test equivalent to OECD 301 E

GLP: not stated

Based on the results of a preliminary toxicity test with Bardac-22 a biodegradation assay was performed with ¹⁴C-didecyldimethylammonium-bromide at the concentrations of 0.1 and 1mg/l. Since the bromide anion in the molecule is rapidly interchangeable this test is also representative for didecyldimethylammonium chloride. The concentration of the ¹⁴C-labelled parent compound remaining in the solution was determined several times during a 43 day incubation period at 20°C by liquid scintillation counting. An almost complete degradation occurred at the 1 mg/l concentration level. Due to significant adsorption to the walls of the vessel, the determination of the degradation at the 0.1 mg/l was not possible. Under the conditions of this study the OECD criteria for ready biodegradability are fulfilled (OECD 301 E test: 70% degradation within 28 days).

[Lonza report No. 1265]

F.1.2. OECD Confirmatory test

Institute: Hoechst, Frankfurt/Main, Germany

Date of report: March 6, 1989

Guideline: OECD-Confirmatory-Test, Official Journal of the European Communities L 133/106, 30.05.88.

GLP: not stated

The biological degradation of Bardac-22 was tested in an OECD-Confirmatory-Test using a model sewage plant. The concentration of DDCA was increased at constant flow rate from 0.32 to 0.83 ppm/h. The concentration of activated sludge was 5 g/l (dry substance). The concentration of DDAC in inflow and effluent as well as the amount adsorbed to the sludge were determined regularly as disulfon blue active substance (DSBAS). The primary biological degradation was 91% on average calculated over the period from day 24 to day 70.

[Lonza report No. 1266]

F.1.3. Microbial respiration test (Sapromat)

Institute: EAWAG, Dübendorf, Switzerland

Date of report: November 6, 1975

Guideline: Scientific report.

GLP: not stated

Microbial respiration tests using waste water from a municipal plant were conducted with Bardac-22 at concentrations of 10 and 20 mg/l. Furthermore, in a separate experiment, the highest concentration of Bardac-22 was inactivated by the addition of 50 mg/l of the negative charged bentonite in order to simulate actual conditions in a sewage plant. The elimination of total organic carbon (TOC) was found to be 90% at 10 mg/l of Bardac-22 and about 30% at 20 mg/l. In the presence of Bardac-22 and bentonite the elimination of TOC amounted to about 95 % as in the control. This indicates that the microbial activity was not adversely affected.

[Lonza report No. 1267]

**F.1.4. Biotic degradation
Inherent biodegradation**

Institute: R & D Central Services

Date of report: June 2, 1998

Guideline: Zahn-Wellens Test (OECD 302 B)

In a Zahn-Wellens Test DDAC showed 87-96 % elimination and 87 -94 % biodegradation determined as DOC after 28 days.

After an adaptation period of 6 days about 80% degradation was attained within the 10-day window. Therefore, DDAC can be termed as readily biodegradable.

[LONZA Report No. 2970]

F.2. Toxicity to aquatic organisms

F.2.1. Growth inhibition of algae

Institute: Biotech Control Laboratories. Waterford, New York.

Date of report: April 20, 1970

Guideline: Fitzgerald Method (Applied Microbiology, Vol.7, 1959, p. 205211)

GLP: no

Chlorella pyrenoidosa (green alga) and *Phormidium inundatum* (black alga) were exposed to Bardac-22 at the concentrations of 0.25, 0.5, 1.0 mg/l for 28 days at 23°C under continuous light. Growth inhibition occurred at 0.5 mg/l, algicidal effects of Bardac-22 at 1.0 mg/l.

[Lonza report No. 1272]

F.2.2. Acute toxicity to Daphnia

Institute: Springborn Laboratories, Inc. Wareham, Mass. USA

Date of report: July 10, 1990

Guideline: US EPA/FIFRA 72-2. Corresponding to OECD 202.

Study performed under GLP.

An 48-hour static test was performed with water fleas (*Daphnia magna*) using ¹⁴C-DDAC at concentrations ranging from 0.019 to 0.12 mg/l. Complete immobilization was found at the highest level tested. No treatment related immobilization or adverse effect were observed at the other concentration levels. The NOEC was 0.074 mg/l and the calculated 48-hours EC₅₀ 0.094/mg/l corresponding to 0.188 mg/l of Bardac-22.

[Lonza report No. 1787]

F.2.3. Acute toxicity to fish

F.2.3.1 Rainbow trout

Institute: Wells Laboratories Inc, Jersey City, NJ /USA

Date of report: May 7, 1971

Guideline: EPA: "Fish Pesticide Acute Toxicity Test Guidelines".

GLP: no.

A 96-hour static test was performed with rainbow trouts (*Salmo gairdneri*) using DDAC at nominal concentrations ranging from 0.6 to 1.6 mg/l. The 96-hour LC₅₀ for the rainbow trout was 1.1 mg/l of DDAC, corresponding to 2.2 mg/l of Bardac-22.

[Lonza report No. 1270]

F.2.3.2 Guppy

Institute: TNO. Delft, The Netherlands

Date of report: March 21, 1978.

Guideline:

GLP: no

A 96-hour semi-static test was performed with guppies (*Poecilia reticulata*) using Bardac-22 at concentrations ranging between 0.032 and 5.6 mg/l. The 96-hours LC₅₀ for Bardac-22 was 1.2 mg/l.

[Lonza report No. 1268]

F.2.4 Other studies

F.2.4.1 Toxicity to bacteria

Institute: Biotech Control Laboratories, Inc. Waterford NY /USA

Date of report: August 25, 1970.

Guideline: American Petroleum Institute Recommended Practice For Biological Analysis of Subsurface Injection Waters, Second Edition, December 1965, Section II - Evaluation of Chemicals For Control of Microbial Growth, Sec. 25-45

GLP: no.

Concentrations of Bardac-22 ranging from 0.5 to 10.0 mg/l were tested for toxicity to bacteria using *Pseudomonas fluorescens*, *Bacillus cereus*, and *Desulfovibrio desulfuricans*. *Pseudomonas fluorescens* and *Bacillus cereus* exhibited no growth at 2.0 mg/l, *Desulfovibrio desulfuricans* at 7.5 mg/l.

[Lonza report No. 1260]