

White Paper

**BIOPROTECT AM 500® Laundry
Applications**



EXECUTIVE SUMMARY

TaxilaTechnologies proposes a new technology that will protect uniforms and other fabrics such as bedding materials from bacterial and microbial infestations. This technology, BIOPROTECT AM 500®, will provide the following benefits:

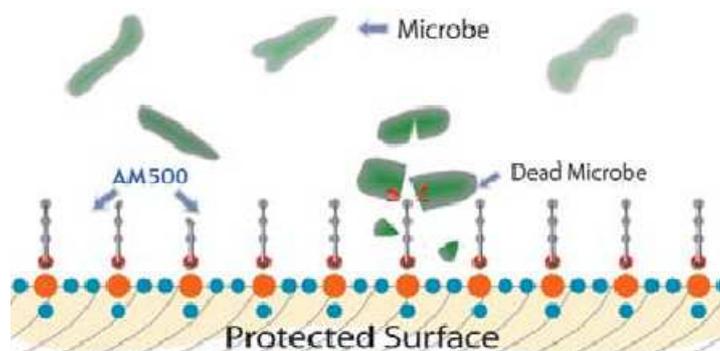
- BIOPROTECT AM 500® reduces or eliminates fabric odor and improves hygiene
- BIOPROTECT AM 500® improves the sanitary conditions and potentially health by making fabric bacteria resistant.
- BIOPROTECT AM 500® extends the life of all fabrics by reducing deterioration of fabric. This is done by embedding a long-lasting microscopic protective barrier throughout the fabric.
- It is effective in reducing static on fabrics

How to use BIOPROTECT AM 500®

BIOPROTECT AM 500® is a new water-based technology that can be used in a machine washer to treat fabrics or while clothing is being soaked in a standing container. In either case, when this molecule is properly introduced and applied to fabrics, the protective, anti-microbial coating that BIOPROTECT AM 500® imparts is the same; only the term of protection will vary depending on the concentration of BIOPROTECT AM 500® being applied. For example this product can be used at home or in the field to treat fabrics for the useful life of the fabric, or BIOPROTECT AM 500® can also be applied and permanently embedded in a material during the manufacturing process.

How BIOPROTECT AM 500® works

AM500's active molecule was designed to work in two different ways. Upon application, the bottom layer of the molecule attaches itself and permanently adheres to any surface that it comes into contact with – hard surface or fabric. Second, the top layer of the molecule establishes a field of carbon atoms that align themselves in vertical spikes. These spikes impale and “shock” any microbe or virus that touches the surface and deliver a fast mechanical kill.



BIOPROTECT AM 500® is a non-toxic, water based solution that has been tested and found to be 99.99% effective in protecting fabrics against a variety of odor causing bacteria, fungus, and mold. In addition, it provides durable antistatic properties and lubricity on all types of fibers. Importantly, this EPA registered (EPA filing 75174-2) product inhibits microbes and viruses without poisons or heavy metals and without harming human cell structures. One application of BIOPROTECT AM 500® lasts through 50+ repeated washings. 100 wash testing has also been successfully conducted, reports are available upon request. BIOPROTECT AM 500® contains no solvents and is not flammable or corrosive.

Protecting fabrics from odor causing bacteria eliminates many of the hygiene problems linked to foul clothing. By eliminating odors and keeping surface areas cleaner, BIOPROTECT AM 500® prolongs the wearing of uniforms and the need to frequently wash bedding and other fabrics, thereby saving large quantities of water, which is often a precious resource.

Applying BIOPROTECT AM 500®

BIOPROTECT AM 500® is easy to apply, cost effective, and can be applied to fabrics in a variety of ways. These methods will be explained more thoroughly in this document. Suggested application methods include:

- A single package designed to enable one person to treat lone washing machine load of about 12-15 pounds of clothing while in the field or at home.
- A program for applying BIOPROTECT AM 500® during the rinse cycle at “industrial” laundries to treat and upgrade uniforms.
- A program for washing fabrics with a pre-mixed combination of AM 500 and a detergent.

The BIOPROTECT AM 500® Laundry Solution Methodology

It is necessary to understand the components and the scientific underpinnings of our solution. Detailed independent studies are contained in the Appendices. These documents were not included in the main body of the document in order to keep the size manageable. Please contact TaxilaTechnologies for any of this information.

How BIOPROTECT AM 500® Works:

- BIOPROTECT AM 500® uses an organo-functional silane technology.
- The product bonds itself through a molecular bond to a substrate or a textile.
- The other end of the molecule is a linear molecule that protrudes from the substrate.
- This linear molecule is only about one thousandth the diameter of a human hair - too small to harm large cells in mammals.
- The linear molecule's base nitrogen ion has a strong positive charge that attracts negatively charged bacteria
- Upon contact, the linear column of carbon atoms physically pierces and disrupts the target organism's cell membrane once it comes into contact with a treated surface.
- This electrostatic mechanism destroys the microbes, as shown in the graphic
- The result is a substrate that remains antimicrobial for a minimum of fifty washes and/or the useful life of the fabric or garment .
- When applied during the manufacturing process BIOPROTECT AM 500® will remain active for the life of the fabric.

Because BIOPROTECT AM 500® physically ruptures the cell walls of microbes, there are no poisons that need to be employed in the process. Moreover, the physical kill does not allow for microbe mutation and the development of "super bugs". The technology is therefore superior to those that use poisons or heavy metals to kill existing germs with only limited and short-term effect.

BIOPROTECT AM 500® Research studies

BIOPROTECT AM 500® has been the subject of many independent research studies that have consistently and repeatedly shown its efficacy. These are readily available upon request but were not included due to the document size.

BIOPROTECT AM 500® Application Methods

Home Laundry Treatment:

This application method:

- Applies BIOPROTECT AM 500® at approximately 4% of the dry clothing weight
- Provides antimicrobial protection for the long life of the fabric
- Needs to be done one time in a month..
- Can be carried out using only a bucket filled with water.

Application procedures:

- The uniform must be clean of excessive dirt and oil for proper initial absorption of the BIOPROTECT AM 500® by the fabric.
- Add the premeasured BIOPROTECT AM 500® packet (liquid) to the washing machine fabric softener dispenser.
- Wash clothes as normal. Dry as normal.

Commercial/Industrial Treatments

The mass processing, or treatment, of fabrics with BIOPROTECT AM 500® can be used to treat uniforms and fabrics already being used as well as uniforms and fabrics previously manufactured but not yet being used. BIOPROTECT AM 500® does not change the look and feel of the treated fabric, so one can't tell which fabric has been treated and which has not. The recommended solution is to use a low, cost-effective dosage on all fabrics in order to incrementally build on AM 500's protective coating with each successive wash.

There are two methods to apply BIOPROTECT AM 500® using the low dosage treatment:

- The preferred method to treat all fabrics is:
 - Use a premixed solution of a recommended detergent mixed with 0.5 (one half of one percent) of BIOPROTECT AM 500® on every wash.
 - Wash and dry as normal.
- A second way is to treat all fabrics is:
 - Run the wash cycle
 - Add 0.5% BIOPROTECT AM 500® of the dry weight of the goods during the rinse cycle
 - Drain the wash extract, unload goods, and dry as usual.
- Increased fabric life:
 - Microbes degrade fabrics by eating through the fibers in fabrics.
 - Because microbes cannot live on clothing treated with AM500 the life span of a fabric can be dramatically increased.
 - The BIOPROTECT AM 500® towel study has shown this product's ability to double the life cycle of a towel.
- Morale and safety factors are difficult to quantify in currency, but we believe them to be of significant benefit. Some of these include:
 - Increased hygiene.
 - Increased morale as body odor is minimized.
 - Improve security because it limits odor
 - Increased morale due to improved fabric cleanliness and appearance.
 - Potential savings on health costs.
- Less water use
 - BIOPROTECT AM 500® treated uniforms can often double the length of time for uniform wear in the field before needing laundering.
 - If BIOPROTECT AM 500® can cut the amount of water used for laundering by a factor of 50% or more, it can save many gallons per week of water per person

Appendix A

BIOPROTECT AM 500® Scientific Studies & Research



SiShield Technologies, Inc.

**REDUCTION/INHIBITION PERCENTAGE RESULTS FOR APPLICATION OF
SIS AM-500 ON THE FOLLOWING ARMY UNIFORMS SAMPLES AGAINST
*STAPHYLOCOCCUS AUREUS.***

**REFERENCED METHODS:
AATCC Test Method 100 - 1993**

Test article: Army Uniforms-US Dept. of Defense

Samples:

- 1) 50/50 Nylon/Cotton Ripstop Control Sample.
- 2) 50/50 Nylon/Cotton LW Twill Marpat Woodland Control
- 3) 50/50 Nylon/Cotton Midweight Twill Marpat Woodland Control
- 4) 100% Nylon 500 Denier Cordura Control
- 5) 100% Nylon 70 Denier Control

Sample Size: 48mm circle
Number of Layer (s): 2
Time of Contact: 24 hours
Contact Temperature: 23° C
Date Contact Initiated: 27April 2009
Incubation Temperature: 37° C
Incubation Time: 24 hours
Date of Plating: 28April 2009

Test Organism:
Staphylococcus aureus

Initial Inoculum
1.84x10⁶ CFU/ml

RESULTS:

Staphylococcus aureus

Sample	CFU/ml after 24 hr Contact Time	% Reduction	% Inhibition
Sample "1" Control	2.09x10 ⁹	N/R	NI
Sample "1" Treated	2.50x10 ²	99.98%	99.98%
Sample "2" Control	3.40x10 ⁹	NR	NI

Sample "2" Treated	<10	99.99%	99.99%
Sample "3" Control	2.70×10^8	NR	NI
Sample "3" Treated	<10	99.99%	99.99%
Sample "4" Control	2.20×10^8	NR	NI
Sample "4" Treated	2.10×10^2	99.98%	99.98%
Sample "5" Control	1.60×10^9	N/R	N/I
Sample "5" Treated	<10	99.99%	99.99%

The overnight culture contained a concentration of 1.84×10^8 CFU/ml and was diluted 1:100 for application to the substrate of 1ml at an estimated 1.84×10^6 CFU/ml.

The following formulas were used to calculate the percent reduction:

$$\text{Percent Reduction (R)} = [(A-B) / A] \times 100$$

Where:

A = Population of bacteria/fungi recovered from untreated samples after 24 hrs of contact
B = Population of bacteria/fungi recovered from treated samples after 24 hrs of contact

Note:

NR= No Reduction

NI = No Inhibition

BIOPROTECT AM 500® Gold Toe Sock Study

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INDUSCO LTD

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Microbac Laboratories, Inc.

*SOUTHERN TESTING & RESEARCH DIVISION
3809 AIRPORT DRIVE, NW
WILSON, NC 27896-8649
(252) 237-4175 (252) 237-9341 (fax)
www.southerntesting.com*

Report of Analysis

April 19, 2007

Workorder #: R2159

W. Thomas Davis
Indusco Co., LTD
2319 Joe Brown Dr.
Greensboro, NC 27405

Phone: 336-375-7555
Fax: 336-375-0826

PO: 14961

Method Reference: ASTM E2149-01 **Inoculum Organism:** Staphylococcus aureus
Contact Time: 24 hours
Sample Type: Gold Toe Socks

<u>Sample #</u>	<u>Client Description</u>		<u>%Reduction</u>
R2159-001	WM 117 White	3.5% Proshield	94.7
R2159-002	WM 117 White	20 Wash	96.3
R2159-003	WM 117 White	50 Wash	98.8
R2159-004	1955S Stone	3.5% Proshield	99.9
R2159-005	1955S Stone	20 Wash	99.8
R2159-006	1955S Stone	50 Wash	96.0
R2159-007	AM-100 Brown	3.5% Proshield	99.9
R2159-008	AM-100 Brown	20 Wash	99.5
R2159-009	AM-100 Brown	50 Wash	99.3
R2159-010	2142S Black	3.5% Proshield	99.9
R2159-011	2142S Black	20 Wash	55.6
R2159-012	2142S Black	50 Wash	99.7
R2159-013	565S Khaki	3.5% Proshield	90.5
R2159-014	565S Khaki	20 Wash	98.7
R2159-015	565S Khaki	50 Wash	99.8

BIOPROTECT AM 500® Glove Study



RESULTS OF BIOSHIELD ANTIMICROBIAL TREATMENT ON KEVLAR SAMPLES AFTER WASHING PRESENTED AS PERCENT REDUCTION

**REFERENCED METHODS:
AATCC Test Method 100 - 1993**

Test article: Kevlar gloves

Samples:

- 1) Control (untreated)
- 2) 20 Wash Sample

Sample Size: 48 mm diameter swatches

Number of Layer(s): 2

Contact Initiation Date: 05Mar2001

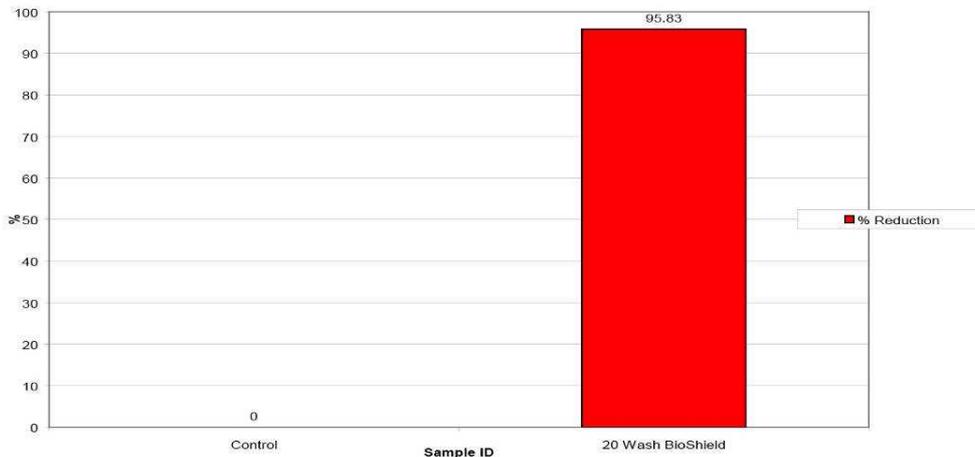
Contact Conditions: 24 hrs @ 23° C with ~80% Relative Humidity

Plate Preparation Date: 06Mar2001

Incubation Temperature: 37°C

Incubation Time: 24 hrs

**Percent Reduction Exhibited in Kevlar Samples After 20 Washes
Against *Staphylococcus Aureus***



BAF Date completed 03/07/2001

BIOPROTECT AM 500® Renfro Sock Study



Test Report
 Shake Flask Method

Lab Number: 08050209
Customer: IndusCo., Ltd.
PAQ Number: 957
Product Desc: Quat Silane

Sales Person:
Engineer:
Sample Material: Fabric

Samples Received: 5/2/2008
Request Reviewed: 5/2/2008
Date Entered: 5/9/2008
Results Approved: 5/9/2008

Sample Number Sample Description	Tested for or using	Test Parameter	Result
08050209-01			
44 Renfro white sock control			
QC0805014	Staphylococcus aureus	Comments	Tempo enumerated
QC0805014	Staphylococcus aureus	Log Reduction	No Reduction
QC0805014	Staphylococcus aureus	Percent Reduction	No Reduction
QC0805014	Staphylococcus aureus	Viable Organisms	> 490000.0
08050209-02			
45 Renfro white sock treated			
QC0805014	Staphylococcus aureus	Comments	
QC0805014	Staphylococcus aureus	Log Reduction	2.9
QC0805014	Staphylococcus aureus	Percent Reduction	99.9
QC0805014	Staphylococcus aureus	Viable Organisms	210
08050209-17			
inoculum			
QC0805014	Staphylococcus aureus	Comments	TC:Sa-03032971969-V2
QC0805014	Staphylococcus aureus	Log Reduction	
QC0805014	Staphylococcus aureus	Percent Reduction	
QC0805014	Staphylococcus aureus	Viable Organisms	160000

Tested by: Crystal Isnhour **Date:** 5/9/2008

Reviewed by: David Loney **Date:** 5/9/2008

The results given here are presumed solely to substantiate the antimicrobial activity of the Microban additives for non-public health applications. The results were obtained using standard laboratory methods. Current EPA guidelines (PR Notice 2000-1) restrict treated article claims to inhibition of microbes for the protection of treated articles against aesthetic problems such as stains and odors or deterioration of the treated material. Claims against pathogenic or disease causing microorganisms are not allowed. All reports are submitted as confidential communications. Authorization for duplication in whole or part is reserved pending our written approval, as a mutual protection.

BIOPROTECT AM 500® Towel Study

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Confidential
 MG102_000, MG102_001x3

Lab No. 08C_25892_01 / 08C_25892_02
 P.O. No. 852728
 Test Facility: NAMSA
 9 Morgan
 Irvine, CA 92618

ASSESSMENT OF ANTIBACTERIAL FINISHES ON TEXTILE MATERIALS
 AATCC TEST METHOD 100

Test Article: Terry Towel with Bio-Shield (0X), Terry Towel with Bio-Shield (10X), ComforTwill Sheeting with Bio-Shield (0X), ComforTwill Sheeting with Bio-Shield (10X)
 ID No. Not Supplied

The test article was received on February 20, 2008.

Test Organism: *Staphylococcus aureus* ATCC 6538

Sample Size: 48 ± 1 mm diameter
 Number of Layers: Eight (8)
 Neutralizer: Lethen Broth
 Target Inoculum Level: (1-2) × 10⁵ CFU/ml
 Inoculum Concentration: *S. aureus* = 2.00 × 10⁵ CFU/ml
 K. pneumoniae = 1.60 × 10⁵ CFU/ml

Sample I.D.	Results (CFU/sample)				
	Zero Contact Time		24 hour Contact Time		Percent Reduction (%)
	<i>S. aureus</i>		<i>S. aureus</i>		<i>S. aureus</i>
* Terry 0X	1.57 × 10 ⁵		1.40 × 10 ³		99.22
* Terry 10X	1.78 × 10 ⁵		1.55 × 10 ³		99.18
* Comfort 0X	1.84 × 10 ⁵		3.50 × 10 ²		99.82
* Comfort 10X	1.82 × 10 ⁵		5.50 × 10 ²		99.71

- * Terry 0X = Terry Towel with Bio-Shield (W/D 0X) (STC #18765)
- * Terry 10X = Terry Towel with Bio-Shield (W/D 10X) (STC #18765)
- * Comfort 0X = ComforTwill Sheeting with Bio-Shield (W/D 0X) (STC #18765)
- * Comfort 10X = ComforTwill Sheeting with Bio-Shield (W/D 10X) (STC #18765)

BIOPROTECT AM 500® Material Data Safety Sheets and Related Certifications
Full MSDS and EPA Registration is Available upon Request



SiShield Technologies Inc.
17 Executive Park Drive , Suite 563, Atlanta GA 30329
Tel : 404.636.8900 Fax : 404.636.8500

Material Safety Data Sheet

SiS AM500

A Silicone Quaternary Ammonium Salt

EMERGENCY TELEPHONE
SiShield Technologies, Inc.

800-424-9300 (CHEMTREC)
404-840-9249 or 404-636-8900

1. Chemical Product Identification

Generic Description: Aqueous Organosilane
Physical Form: Liquid
Color: Colorless to pale yellow
EPA Registration Number: 75174-2
Last Revision: Jan 5, 08

2. Composition/Data Ingredients

INGREDIENTS	CAS #	TWA	STEL	% by Weight
Octadecylaminodimethyltrimethoxysilylpropyl ammonium chloride	27668-52-6	N/A	N/A	5%
Chloropropyltrimethoxysilane	2530-87-2	0.1 ppm	N/A	<3
* Other ingredient				

Note: The above information is not intended for use in preparing product specifications.

3. Hazards Identification Emergency Overview

Appearance and Odor: Colorless to pale yellow liquid, odorless to slight alcoholic
Primary Routes of Entry: Skin contact, Eye contact, Inhalation

This material contains the following components with the special hazards listed below .

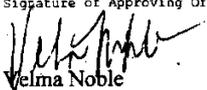
Carcinogens	Teratogens	Reproductive Toxins	Sensitizers
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75174-2

10-22-2003

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

 <p>U.S. ENVIRONMENTAL PROTECTION AGENCY Office of Pesticide Programs Antimicrobials Division (7510C) 1200 Pennsylvania Avenue, N.W. Washington, D.C. 20460</p>	EPA Reg. Number: 75174-2	Date of Issuance: OCT 22 2003
	Term of Issuance: CONDITIONAL	
NOTICE OF PESTICIDE: <input checked="" type="checkbox"/> Registration <input type="checkbox"/> Reregistration		Name of Pesticide Product: SiS AM 500
Name and Address of Registrant (include ZIP Code): SiShield Technologies, Inc. 5555 Glenridge Connector Suite 200 Atlanta, GA 30342		
On the basis of information furnished by the registrant, the above named pesticide is hereby registered/re-registered under the Federal Insecticide, Fungicide and Rodenticide Act.		
Registration is in no way to be construed as an endorsement or recommendation of this product by the Agency. In order to protect health and the environment, the Administrator, on his motion, may at any time suspend or cancel the registration of a pesticide in accordance with the Act. The acceptance of any name in connection with the registration of a product under this Act is not to be construed as giving the registrant a right to exclusive use of the name or to its use if it has been covered by others.		
This product is conditionally registered in accordance with FIFRA sec. 3(c)(7)(A) provided that you:		
1. Submit and/or cite all data required for registration of your product under FIFRA sec. 3(c)(5) when the Agency requires all registrants of similar products to submit such data; and submit acceptable responses required for reregistration of your product under FIFRA section 4.		
2. Add the phrase EPA Registration Number "EPA Reg. No. 75174-2".		
Signature of Approving Official:  Velma Noble Regulatory Management Branch 1 Antimicrobial Division (7510C)	Date: OCT 22 2003	

EPA Form 8570-6

CONCURRENCES							
SYMBOL	7510C						
SURNAME	J. [Signature]						
DATE	10/22/03						

EPA Form 1320-1A (1/90)

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