



## FACT SHEET No. 33

### TEXTILE TREATMENTS WITH ZOONO

The active agent in Zoono (3-trihydroxysilylpropyldimethyloctadecyl ammonium chloride) has successfully been applied to fabrics and textiles since the late 1970's.

Dow Corning obtained the original EPA registration and applied the technology successfully as an antimicrobial finish for textiles. This treatment was to preserve fabrics against rotting and mildew stain, especially in storage. It also inhibited odour development resulting from biological growth - especially in fabrics exposed to perspiration.

Early successful commercial application of this new product was 'no foot-odour' BioGuard socks, which retained anti-organoleptic activity through multiple washings.

Dow Corning abandoned sale of this product in 1992 due to corporate bankruptcy and a refocus of corporate strategy on commercial production and sale of silicone products.

A fresh EPA registration for this product was obtained in 2002 and has resulted in continued application of the active (3-trihydroxypropyl silyldimethyloctadecyl ammonium chloride) under the Zoono registration for textile treatments and a wide variety of other applications to various substrates.

As the active ingredient in Zoono is exactly the same as originally introduced and registered by Dow Corning, all previous testing results remain valid.

Following scientific protocols, original research results are typically cited. Newer studies reporting similar results are typically not reported.

Zoono provides a durable antimicrobial finish for textiles. It is effective in significantly reducing common odour causing bacteria (Table I).

The durability of Zoono treatment on treated fabrics (Table II) demonstrates that after 40 complete wash cycles the activity of the treatment was not diminished and remained as active as before the washings.

Additionally, common commercial laundry detergents did not reduce the antimicrobial activity. The antimicrobial effects of Zoono treatments are not reduced over a 24 hour period of extractions involving 130,000 oscillations using water or simulated sweat.

Treatment with Zoono has successfully been applied to cotton, cotton/polyester sheeting, outerwear fabrics, underwear, nylon hosiery, non-woven fabrics, mattress ticking, throw rugs and filter fabrics.

Applications to carpeting exhibits sustained aero-microbiological reductions of fungi in commercial buildings (Table A).

This study is one of 10 studies with similar results demonstrating reduction in fungal contamination in the air simply by treating carpeting with Zoono.

Similar reductions in bacteria in treated carpeting was also demonstrated (Tables C, D).

Complete fungal reduction in treated carpet over 12 weeks was also demonstrated. (Table B)

Zoono has also demonstrated to suppress fungal growth on wall board, cinder block and other construction materials. Zoono treatments of new home construction have enabled 15 year guarantees (American MoldGuard, 2005) of no fungal contamination after treatment, demonstrating the durability of Zoono treatments.

(Tables *attached* below)



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### ANTIMICROBIAL TREATMENT FOR FABRICS AND TEXTILES

Treatment of textiles and fabrics with Zoono followed by thorough drying to bond the Zoono active agent to the material produces a durable, antimicrobial coating, called a finish, to the fabric.

The bonded finish protects against odour causing bacteria, mildew and mould which can cause deterioration and discoloration of the material.

Zoono is effective against a broad spectrum of bacteria. Odour causing bacteria commonly found in fabrics and apparel such as sheets, hosiery, outerwear, underwear, footwear, non-woven fabrics, etc. are effectively reduced by treated fabrics.

**TABLE I**

<b>(Common Odour Causing Bacteria Reduction)</b>	
<b>Organism</b>	<b>% bacterial Reduction</b>
<i>Micrococcus sp.</i>	99
<i>Staphylococcus epidermis</i>	96
<i>Enterobacter agglomerans</i>	90
<i>Acinetobacter calcoaceticus</i>	99
<i>Staphylococcus aureus</i>	99

For an antimicrobial finish on treated fabrics to be useable, potentially for the life of the article, it must be durable to repeated laundering and retain its protection / activity.

The following Table II demonstrates the durability of treated fabrics after repeated washing cycles.

**TABLE II**

<b>(Laundered Fabric Durability)</b>	
<b>No. of Wash Cycles</b>	<b>% Bacterial Reduction</b>
0	97.9
1	98.5
20	99.7
40	98.1

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Common household detergents may be used to launder treated fabrics and textiles without loss of antimicrobial protection / activity.

**TABLE III**

**(Detergent effects on Antimicrobial Activity of Treated Fabrics)**

<b>Detergent</b>	<b>% Bacterial Reduction*</b>
Water Only	99.6
Tide	99.2
Arm & Hammer	98.9
Dynamo	98.6
Cheer	99.2

\*Testing reflects bacterial reductions of treated fabrics after laundering with the specified detergents



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**CARPET APPLICATIONS**

Comparison of carpets treated with Zoono active material vs untreated

**TABLE A**

**(Antibacterial Activity of Nylon Carpet in a 36 month Use Study at Duke Hospital)**

Sample	Percent Bacterial Insult Reduction*			
	Before Installation	12 months Wear	22 months Wear	36 months Wear
Untreated	0	0	2.3	3.8
Treated	85	91	78	87

\*Bacterial Inoculum Insult was *Klebsiella Pneumoniae*

The above study is representative of sustained aero-microbiological reductions utilizing silane-modified quaternary amines (Zoonocide). The above findings represent one study of ten performed on schools, hospitals and commercial buildings across the U.S. Studies were conducted in KY, FL, NY, CO and OH. (Kemper, White & Gettings, *J. Indus. Microbiology*, 31 (5), 1990).

**TABLE B**

**Antifungal Activity on Treated and Untreated Nylon Carpet**  
 (Twelve -Week Tropical Chamber Exposure)  
 Percent Covered by Fungi at No. of Weeks Exposure\*

Sample	1 Week	6 Weeks	12 Weeks
<b>Nylon Control/Untreated</b>			
Unwashed, No Shampooing	100	100	100
7 Shampoo Cycles	100	100	100
14 Shampoo Cycles	100	100	100
21 Shampoo Cycles	100	100	100
<b>Nylon/Treated</b>			
Unwashed, No Shampooing	0	0	0
7 Shampoo Cycles	0	0	0
14 Shampoo Cycles	0	0	0
21 Shampoo Cycles	0	0	0

\*Samples were re-challenged with a spore suspension of *Aspergillus niger* and *Penicillium variable* at 3, 6 and 9 weeks of the study. Cleaning agents used were Fiber Fresh, Woolite.

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**TABLE C**

Control of Bacterial Clinical isolates on Rugs		
Sample	Organism	% Reduction
Control/Untreated		0
Treated	Streptococcus fecalis	100
Inoculum		0
Control/Untreated		0
Treated	Staphylococcus aureus	100
Inoculum		0
Control/Untreated		20
Treated	Escherichia coli	99+
Inoculum		1
Control/ Untreated		47
Treated	Klebsiella oxytoca	100
Inoculum		1

**TABLE D**

Bacterial Adaptation Studies on Treated/Untreated Carpet										
Percentage Reduction (Shake Flask Test)										
Exposure*	<i>Klebsiella Pneumoniae</i>					<i>Staphylococcus aureus</i>				
	1	2	3	4	5	1	2	3	4	5
Untreated Nylon Carpet	0	0	0	0	0	10	5	9	13	26
Treated Nylon Carpet	99.8	99.6	98.8	97.5	99.9	98.6	97.5	96.3	99.4	98.8

\* Shake Flask Survivors were used for subsequent exposures

Ends.