

DURABILITY REPORT

FabriSafe™



WHERE MICROBES DIE BY THE SWORD.



THE ULTIMATE IN PROTECTION

FabriSafe

FabriSafe antimicrobial treatment is today's most environmentally-friendly and most powerful protection from the hazards of microorganisms in the form of viruses and bacteria. FabriSafe exceeds stringent healthcare and hospitality industry requirements for germ safety. Yet, this revolutionary product has the toxicity of Vitamin C, outlasts chemical applications, destroys more than 100 microbes from staph to parasites, and can withstand more than 130,000 agitations -the wear equivalent of over 100 commercial launderings.

Durability Study

The study describes application of FabriSafe to a number of substrates and analysis for any "leachable" or any water soluble materials. The purpose of the study was to determine the amounts of FabriSafe material that might be removed under exaggerated conditions.

Test materials included polyester (representative of pure synthetics), cotton (a hollow fiber representative of natural materials) and cotton/polyester (50/50: representative of blends of natural and synthetic fibers). Substrates were treated, dried and contacted with a solution of bromophenol blue which reacts with the active antimicrobial agent on the substrate surface, but not the substrate.

The test samples were then extracted with water at 37 degrees C. for 24 hours while being agitated. Agitation involved 40-50 oscillations/minute for a total of 130,000 start/stop oscillations over the 24 hour test period. Samples were also heated to 120-140 degrees F. prior to extraction to simulate sun exposure, heated drying conditions and or ironing. Extracts were then analyzed with a Cary UV spectrophotometer at 604 nm. Limit of detection was 50 ppb.

Identical more severe extractions were performed using synthetic equivalents of human sweat at pH of 4 and 7 under the same conditions of agitation and duration. Results were the same as for water extraction and are summarized below.

TABLE A

Results of Water Extraction

| Substrate | Control | Treated | Treated / Heated |
|------------------|---------|---------|------------------|
| Polyester | ND | ND | ND |
| Cotton | ND | ND | ND |
| Polyester/Cotton | ND | ND | ND |

Note: ND = not detected, <50 ppb.

Conclusion

FabriSafe, when applied to fabric substrates and subjected to exaggerated washing conditions was shown to be durable, non-leaching and remain fixed to the substrate. Bacterial reductions of washed fabric samples were found to be unchanged (greater than 98%) after 100 machine washings.



ANTIMICROBIAL TREATMENT FOR TEXTILES AND FABRICS

FABRIC FINISH STUDY

Treatment of textiles and fabrics with FabriSafe followed by thorough drying to bond the FabriSafe active agent to the material produces a durable, antimicrobial coating, called a finish, to the fabric. This bonded finish protects against odor causing bacteria, mildew and mould which can cause deterioration and discoloration of the material.

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

TABLE I

Common Odor Causing Bacteria Reduction

| Organism | % Bacterial Reduction |
|------------------------------------|-----------------------|
| <i>Micrococcus sp.</i> | 99 |
| <i>Staphylococcus epidermis</i> | 96 |
| <i>Enterobacter aglomerans</i> | 90 |
| <i>Acinetobacter calcoaceticus</i> | 99 |
| <i>Staphylococcus aureus</i> | 99 |

For an antimicrobial finish on treated fabrics to be useable for the life of the article, it must be durable to repeated laundering and retain its activity. The following Table II demonstrates the durability of treated fabrics after repeated washing cycles.

TABLE II

Laundered Fabric Durability

| No. of Wash Cycles | % Bacterial Reduction |
|--------------------|-----------------------|
| 0 | 97.9 |
| 1 | 98.5 |
| 20 | 99.7 |
| 10 | 98.1 |
| 100 | 98.7 |

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

TABLE III

Detergent effects on Antimicrobial Activity of Treated Fabrics

| Detergent | % Bacterial Reduction* |
|--------------|------------------------|
| 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*



TEXTILE TREATMENTS WITH FABRISAFE

HISTORY & CONCLUSIONS

The active agent in FabriSafe (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 odor development resulting from biological growth - especially in fabrics exposed to perspiration.

Early successful commercial application of this new product was 'no foot-odor' 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 new EPA registration for this product was obtained in 2002 and has continued application of the active (3-trihydroxypropyl silyldimethyloctadecyl ammonium chloride) under the registration for textile treatments and a wide variety of other applications to various substrates.

As the active ingredient in FabriSafe 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.

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

The durability of FabriSafe treatment on treated fabrics (Table II) demonstrates that after 100 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 (Table III). The antimicrobial effects of FabriSafe treatments are not reduced over a 24 hour period of extractions involving 130,000 oscillations using water or simulated sweat.

Treatment with FabriSafe has successfully been applied to polyester, 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).

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