

**Antibacterial and Laundering Properties of AMS and PHMB as Finishing Agents for
Healthcare Workers Uniforms**

by

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(ABSTRACT)

The safety of healthcare workers (HCW) has become a serious concern; therefore, a need for protection against bacterial penetration and transmission is realized. The purpose of this research is to examine whether antibacterial finishes can effectively reduce the presence of bacteria that have the potential for penetration and transmission on healthcare workers uniforms (HCWU). The specific objective of this research is to compare the antibacterial properties (i.e., bacterial reduction), two descriptive properties (i.e., fabric weight, fabric thickness), and one durability property (i.e., breaking strength loss due to abrasion) of a 65/35% polyester/cotton blend fabric treated with two commercially available antibacterial agents (i.e., 3-trimethoxysilylpropyldimethyloctadecyl ammonium chloride) or AEGIS Microbeshield, (AMS) and polyhexamethylene biguanide (PHMB) or Reputex™ before laundering and after 5, 10, and 25 laundering cycles. The independent variables were the treatments (i.e., AMS, PHMB, no treatment) and the laundering cycles (i.e., 0, 5, 10, 25). The dependent variables were the four fabric properties: (a) antibacterial properties against *Staphylococcus aureus* (*S. aureus*) and *Klebsiella pneumoniae* (*K. pneumoniae*) bacteria, (b) fabric weight, (c) fabric thickness, and (d)

breaking strength loss due to abrasion. Multiple Analysis of Variance (MANOVA) and Two-way Analysis of Variance (ANOVA) were used to examine the effects of the independent variables and their interaction on each dependent variable.

The results showed PHMB treated specimens had a significantly higher log reduction against both *S. aureus* and *K. pneumoniae* before laundering and after 5, 10 and 25 laundering cycles than AMS treated specimens and the no treatment specimens. Initially, AMS had some reduction against *S. aureus* and *K. pneumoniae* before laundering; however after laundering, the reductions against both bacteria were diminished greatly. As expected, the no treatment specimen had no reduction against *S. aureus* or *K. pneumoniae* before and after laundering. The addition of PHMB and AMS increased the fabric weight of 65/35% polyester/cotton fabric and kept the fabric thickness throughout 25 laundering cycles. The untreated specimens became thicker after 25 laundering cycles. In addition, the breaking strength loss due to abrasion indicated that treatments had no effect on fabric strength.

In conclusion, adding antibacterial agents do have some influence on bacterial reduction for both Gram-positive and Gram-negative bacteria as well as descriptive properties (i.e., fabric weight, fabric thickness). However, there was no influence on durability property (i.e., breaking strength loss due to abrasion). More studies are needed to test both agents on other types of fabrics such 100% cotton and nonwoven to incorporate more treated HCWU in the marketplace.

DEDICATION

PAST...

In loving memory of my grandparents, Walter and Mozelle Eberhardt for their love and support.
Although you are not here, you will forever remain in my heart.

PRESENT...

To my dad, Jerry Eberhardt, Sr. for EVERYTHING. I feel like the luckiest daughter in the world to have a dad so wonderful! Thank you for impacting my life so greatly, I feel so bless.

FUTURE...

To my daughter, D'Malyah Anzelle (DD). What a blessing, it's like looking in a mirror.
Everything I do is for you. It's joy beyond words having you in my life.

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“I can do all things through Christ who strengthens me” Philippians 4:13

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