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Antibacterial Finishes on Textile Materials: Assessment of

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1. Purpose and Scope

1.1 This test method provides a quantitative procedure for the evaluation of the degree of antibacterial activity. Assessment of antibacterial finishes on textile materials is determined by the degree of antibacterial activity intended in the use of such materials. If only bacteriostatic activity (inhibition of multiplication) is intended, a qualitative procedure which clearly demonstrates antibacterial activity as contrasted with lack of such activity by an untreated specimen may be acceptable. However, if bactericidal activity is intended or implied, quantitative evaluation is necessary. Quantitative evaluation also provides a clearer picture for possible uses of such treated textile materials.

2. Principle

2.1 This test method provides a quantitative procedure for the comparison and evaluation of the degree of antibacterial activity after a 24 h exposure to the test bacteria on the test fabric. After incubation, the bacterial challenge is eluted from the swatches and enumerated and a percent reduction by the fabric specimen is calculated.

3. Terminology

3.1 **activity**, n.—*of an antibacterial agent*, a measure of effectiveness of the agent.

3.2 **antibacterial agent**, n.—*in textiles*, any chemical which kills bacteria (bactericide) or interferes with the multiplication, growth or activity of bacteria (bacteriostat).

4. Safety Precautions

NOTE: These safety precautions are for information purposes only. The precautions are ancillary to the testing procedures and are not intended to be all inclusive. It is the user's responsibility to use safe and proper techniques in handling materials in this test method. Manufacturers MUST be consulted for specific details such as material safety data sheets

and other manufacturer's recommendations. All OSHA standards and rules must also be consulted and followed.

4.1 This test should be performed only by appropriately trained personnel. The U.S. Department of Health and Human Services publication, *Biosafety in Microbiological and Biomedical Laboratories*, should be consulted (see 12.1).

4.2 CAUTION: Some of the microorganisms used in these tests are allergenic and pathogenic; i.e., capable of infecting humans and producing disease. Therefore, every necessary and reasonable precaution must be taken to eliminate this risk to the laboratory personnel and to personnel in the associated environment. Wear protective clothing, respiratory protection, and impervious gloves when working with the organisms.

4.3 Good laboratory practices should be followed. Wear safety glasses in all laboratory areas.

4.4 All chemicals should be handled with care.

4.5 An eyewash/safety shower should be located nearby for emergency use.

4.6 Sterilize all contaminated samples and test materials prior to disposal.

4.7 Exposure to chemicals used in this procedure must be controlled at or below levels set by government authorities (e.g., Occupational Safety and Health Administration's [OSHA] permissible exposure limits [PEL] as found in 29 CFR 1910.1000; see web site: www.osha.gov for latest version). In addition, the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) comprised of time weighted averages (TLV-TWA), short term exposure limits (TLV-STEL) and ceiling limits (TLV-C) are recommended as a general guide for air contaminant exposure which should be met (see 12.2).

5. Limitations

5.1 For a qualitative, relatively quick and easily executed method to determine antibacterial activity of textile materials, refer to AATCC Method 147, Antibacterial Activity Assessment of Textile Materials: Parallel Streak Method.

6. Test Organisms

6.1 Test bacteria:

6.1.1 *Staphylococcus aureus*, ATCC No. 6538, Gram positive organism, CIP 4.83, DSM 799, NBRC 13276, NCIMB 9518 or equivalent strain (see 12.3 and 12.4).

6.1.2 *Klebsiella pneumoniae*, ATCC No. 4352, Gram negative organism, CIP 104216, DSM 789, NBRC 13277, NCIMB 10341 or equivalent strain (see 12.3 and 12.4).

6.1.3 Other suitable species can also be used depending on the intended end-use of the test sample.

7. Materials, Media and Reagents

7.1 Media and reagents. Suitable broth/agar media are:

7.1.1 Nutrient broth/agar.

7.1.2 Trypticase Soy broth/agar.

7.1.3 Brain-Heart Infusion broth/agar.

7.1.4 Müller-Hinton broth/agar.

7.1.5 Slurry Inoculum Carrier (for hydrophobic fabrics):

Sodium Chloride 8.5 g

Agar 3.0 g

Sterile Distilled Water 1000 mL.

7.2 Materials.

7.2.1 Incubator maintained at $37 \pm 2^\circ\text{C}$ ($99 \pm 4^\circ\text{F}$).

7.2.2 Inoculating loop.

7.2.3 Bunsen Burner or equivalent.

7.2.4 Water bath maintained at $45\text{--}50^\circ\text{C}$ ($113\text{--}122^\circ\text{F}$).

7.2.5 Pipettes, 1 mL, sterile or equivalent.

7.2.6 Culture Tubes with caps; minimum 10 mL capacity.

7.2.7 Petri dishes, 100 mm diam. $\times$ 15 mm deep, sterile.

7.2.8 Forceps, sterile.

7.2.9 Stereomicroscope, minimum 40X magnification.

7.2.10 Ruler.

8. Test Specimens

8.1 Preparation. The following description will be in terms of fabric swatches. Textile materials not in fabric form can likewise be tested with the appropriate modification.

8.1.1 Size and shape of treated swatches: Cut circular swatches 4.8 ± 0.1 cm (1.9 ± 0.03 in.) in diameter, from the test fabric (preferably with a steel die). Stack the swatches in a 250 mL wide-mouth glass jar with screw cap or other appropriate closed container. The number of swatches to be used is dependent on the fiber type and fabric construction. Use that amount of fabric which will absorb the 1.0 ± 0.1 mL of inoculum, and leave no free liquid in the jar. For example, 4 swatches of cotton print cloth will absorb 1 mL. The number of swatches used per jar should be reported.