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Antimicrobial Activity Assessment of New Carpets

Developed in 1991 by Committee RA31; revised 1992, 2011 (with title change); editorially revised and reaffirmed 1993; reaffirmed 1998, 2016; editorially revised 2004, 2010.

1. Purpose and Scope

1.1 This test method is designed to determine the antimicrobial activity of new carpet materials and consists of three procedures: a qualitative antibacterial assessment, a quantitative antibacterial assessment and qualitative antifungal assessment. It may also be used to evaluate the effect of a cleaning process (agreed upon by the interested parties) on the antimicrobial resistance of carpets.

2. Principle

2.1 This test method consists of three procedures, Test I, II and III which can be used singly or in combination, depending on the extent of proof of antimicrobial activity the end-user is interested in acquiring. Test I is a qualitative assessment of antibacterial activity using both a Gram-positive and Gram-negative bacteria that can produce results in 24 h. Test II 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 carpet swatches. Then the bacterial challenge is eluted from the swatches and enumerated and a percent reduction by the carpet specimen is calculated. Test III is for assessment of the antifungal activity of carpet and resistance to a common fungal organism on nutrient rich medium.

3. Terminology

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

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

3.3 **antifungal agent**, n.—any chemical which kills or inhibits the growth of fungi.

3.4 **antimicrobial agent**, n.—any chemical which kills or inhibits the growth of microorganisms.

3.5 **bacterial resistance**, n.—in textiles, resistance to the development of visible bacterial growth and accompanying odors, resulting from bacterial degradation of fibers or soil on them, as distinguished from musty fungal odors.

3.6 **mildew resistance**, n.—in textiles, resistance to the development of unsightly fungal growths and accompanying unpleasant, musty odors on carpet materials exposed to conditions favoring such growths.

3.7 **rot resistance**, n.—in textiles, resistance to deterioration of a carpet material as a result of fungal growth in or on it.

3.8 **zone of inhibition**, n.—clear area of no growth of a microorganism, cultured onto the surface of agar growth medium, in proximity to the borders of a specimen placed in direct contact with this agar surface.

NOTE: A zone of inhibition occurs as result of the diffusion of an antimicrobial agent from the specimen.

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 trained personnel. The U.S. Department of Health and Human Services publication *Biosafety in Microbiological and Biomedical Laboratories* should be consulted (see 25.1).

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. Choose respiratory protection that prevents penetration by the spores.

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 25.2).

5. Uses and Limitations

5.1 This test method is designed for use only for new carpets and must not be used for carpets that have been laid down and used.

I. Qualitative Assessment of Antibacterial Activity on Carpets: Single Streak Method

6. Principle

6.1 Specimens of the test material, including corresponding untreated controls of the same material (if available but not required), are placed in intimate contact with the agar surface which has been previously streaked with a bacterial culture. After incubation, a clear area of interrupted growth underneath and along the sides of the test material indicates antibacterial activity of the specimen. Standard strains of bacteria are used with *Staphylococcus aureus* (Gram positive) and *Klebsiella pneumoniae* (Gram negative), the representative organisms.

7. Test Organisms

7.1 *Staphylococcus aureus*, ATCC 6538, CIP 4.83, DSM 799, NBRC 13276, NCIMB 9518 or equivalent strain (see 25.3 and 25.4).

7.2 *Klebsiella pneumoniae*, ATCC 4352, CIP 104216, DSM 789, NBRC 13277, NCIMB 10341 or equivalent strain (see 25.3 and 25.4).

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

8. Materials, Media and Reagents

8.1 Media and Reagents. Suitable