the speed of glutaraldehyde at their respective minimum effective concentrations.

REFERENCES

1. Alvarado CJ, Stolz SM, Maki DG. Nosocomial infection and pseudoinfection from contaminated endoscopes and bronchoscopes. *MMWR* 1991;40:675-678 (including editorial note).
2. Nelson KE, Larson PA, Schraufnagel DE, Jackson J. Transmission of tuberculosis by flexible fiberbronchoscopes. *Am Rev Respir Dis* 1983;127:97-100.
3. Spach DH, Silverstein FE, Stamm WE. Transmission of infections by gastrointestinal endoscopy and bronchoscopy. *Ann Intern Med* 1993;118:117-128.
4. Wheeler PW, Lancaster D, Kaiser AB. Bronchopulmonary cross-colonization and infection related to mycobacterial contamination of suction valves of bronchoscopes. *J Infect Dis* 1989;159:954-958.
5. Ascenzi JM, Ezzell RJ, Wendt TM. A more accurate method for measurement of tuberculocidal activity of disinfectants. *Appl Environ Microbiol* 1987;53:2189-2192.
6. Isenberg HD, Giugliano ER, France K, Alperstein P. Evaluation of three disinfectants after in-use stress. *J Hosp Infect* 1988;11:278-285.
7. Robison RA, Osguthorpe RJ, Carroll SJ, Leavitt RW, Schaalje GB, Ascenzi JM. Culture variability associated with the US Environmental Protection Agency Tuberculocidal Activity Test Method. *Appl Environ Microbiol* 1996;62:2681-2686.
8. Newman KA, Tenney JH, Oken HA, Moody MR, Wharton R, Schimpff SC. Persistent isolation of an unusual *Pseudomonas* species from a phenolic disinfectant system. *Infect Control* 1984;5:219-222.
9. Sautter RL, Mattman LH, Legaspe RC. *Serratia marcescens* meningitis associated with contaminated benzalkonium chloride solution. *Infect Control* 1984;5:223-225.
10. vanKlingeren B, Pullen W. Glutaraldehyde resistant mycobacteria from endoscope washers. *J Hosp Infect* 1993;25:147-149.
11. Russell AD, Hammond SA, Morgan JR. Bacterial resistance to antiseptics and disinfectants. *J Hosp Infect* 1986;7:213-225.
12. US Environmental Protection Agency. Tuberculocidal activity test method. In: Campt DD, ed. *Data Call-In Notice for Tuberculocidal Effectiveness Data for All Antimicrobial Pesticides With Tuberculocidal Claims.* Washington, DC: US Environmental Protection Agency; 1988:1-8.
13. Association of Official Analytical Chemists. Tuberculocidal activity of disinfectants. In: Williams S, ed. *Official Methods of Analysis of the AOAC.* 14th ed. Arlington, VA: AOAC; 1984:73-74.
14. Rutala WA, Cole EC, Wannamaker NS, Weber DJ. Inactivation of *Mycobacterium tuberculosis* and *Mycobacterium bovis* by 14 hospital disinfectants. *Am J Med* 1991;91(suppl 3B):267S-270S.
15. Collins FM, Montalbine V. Mycobactericidal activity of glutaraldehyde solutions. *J Clin Microbiol* 1976;4:408-412.
16. Cole EC, Rutala WA, Nessen L, Wannamaker NS, Weber DJ. Effect of methodology, dilution, and exposure time on the tuberculocidal activity of glutaraldehyde-based disinfectants. *Appl Environ Microbiol* 1990;56:1813-1817.
17. Urayama S, Kozarek RA, Sumida S, Raltz S, Merriam L, Pethigal P. Mycobacteria and glutaraldehyde: is high-level disinfection of endoscopes possible? *Gastrointest Endosc* 1996;43:451-456.
18. Association of Official Analytical Chemists. Tuberculocidal activity of disinfectants. In: *Official Methods of Analysis of the AOAC.* 13th ed. Arlington, VA: AOAC; 1980:65-66.
19. Association Francaise de Normalisation (AFNOR). Recueil de normes francaises des antiseptiques et desinfectants. In: *Antiseptics and Disinfectants.* Edition bilingue. Paris, France: AFNOR; 1981.
20. Best M, Sattar SA, Springthorpe VS, Kennedy ME. Comparative mycobactericidal efficacy of chemical disinfectants in suspension and carrier tests. *Appl Environ Microbiol* 1988;54:2856-2858.
21. Best M, Sattar SA, Springthorpe VS, Kennedy ME. Efficacies of selected disinfectants against *Mycobacterium tuberculosis. J Clin Microbiol* 1990;28:2234-2239.
22. Sonntag HG. Desinfektions verfahren bei Tuberculose. *Hygiene und Medizin* 1978;3:322-325.
23. Sonntag HG, Hingst V. Comparative studies on the effects of disinfectants on *M. tuberculosis* and *M. terrae. Zentrablatt Bakteriologie B: Hygiene* 1985;181(Serie B):31. Abstract.
24. vanKlingeren B, Pullen W. Comparative testing of disinfectants against *Mycobacterium tuberculosis* and *Mycobacterium terrae* in a quantitative suspension test. *J Hosp Infect* 1987;10:292-298.
25. Griffiths PA, Babb JR, Fraise AP. *Mycobacterium terrae:* a potential surrogate for *Mycobacterium tuberculosis* in a standard disinfectant test. *J Hosp Infect* 1998;38:183-192.
26. Hingst V, Wurster C, Sonntag HG. A quantitative test method for the examination of antimycobacterial disinfection procedures. *Zentrablatt fur Hygiene und Umweltmedizin* 1990;190:127-140.
27. Jette LP, Ringuette L, Ishak M, Miller M, Saint-Antoine P. Evaluation of three glutaraldehyde-based disinfectants used in endoscopy. *J Hosp Infect* 1995;30:295-303.
28. Alfa MJ, Sitter DL. Inhospital evaluation of orthophthalaldehyde as a high level disinfectant for flexible endoscopes. *J Hosp Infect* 1994;26:15-26.
29. Robison RA, Robinson DF, Ploeger BJ, Christensen RP. Clinical and laboratory efficacy tests of a new disinfectant. *J Dent Res* 1991;70:438. Abstract.

PCR and Conventional Tests Used for MRSA Detection

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Conventional and molecular techniques are being used in the detection of methicillin resistance in *Staphylococcus aureus* (MRSA) but they do not always show concordant results. Araj and coinvestigators from the Department of Pathology and Laboratory Medicine, American University of Beirut Medical Center, Lebanon, compared a *mec*A polymerase chain reaction (PCR)-based amplification with the 1 µg oxacillin disk-diffusion test and the Epsilometer test (E-test) for detection of minimum inhibitory concentrations (MICs). Among 31 isolates initially characterized as MRSA by the disk-diffusion test, *mec*A was detected in only 13 isolates (42%). The E-test showed a wide range of oxacillin MICs (0.5->256 µg/mL) among these 31 MRSA isolates: 7 isolates had an MIC of >256 µg/mL, 1 had 64 µg/mL, 2 had 4 µg/mL, 2 had 3 µg/mL, 1 had 2.5 µg/mL, 9 had 2 µg/mL, 3 had 1.5 µg/mL, 5 had 1 µg/mL, and 1 had 0.5 µg/mL.

Comparing the *mec*A PCR results with the E-test oxacillin MIC findings revealed that *mec*A was detected in 7 of 8 isolates (87.5%) with an MIC of ≥64 µg/mL, in 3 of 14 isolates (21.4%) with an MIC of 2 to 4 µg/mL, and in 3 of 9 isolates (33.3%) with an MIC of <2 µg/mL. B-Lactamase production was positive in 28 of 31 isolates (90.3%). Because of this variation between tests, and because several resistance mechanisms are known to mediate methicillin resistance in *S aureus,* the reliable detection of MRSA cannot be based solely on detection of *mec*A gene in *S aureus.*

At this stage, and until new guidelines are introduced by an official body such as NCCLS, a combination of conventional methods alone or together with a molecular method should be used every time *S aureus* is tested for detection of methicillin resistance.

FROM: Araj GF, Talhouk RS, Simaan CJ, Maasad MJ. Discrepancies between *mec*A PCR and conventional tests used for detection of methicillin resistant *Staphylococcus aureus. Int J Antimicrob Agents* 1999;11:47-52.