LETTERS TO THE EDITOR

Hydrogen Peroxide Vapor and Aerosol Room Decontamination Systems

To the Editor—We read with great interest the recent article by Holmdahl et al,[1] "A Head-to-Head Comparison of Hydrogen Peroxide Vapor and Aerosol Room Decontamination Systems," which compared 2 distinctly different hydrogen peroxide vapor systems. The study, as designed, was well executed and obtained results that could be expected on the basis of the methodology employed. We would like to point out to readers and to the study authors some points of methodology that we do not believe are appropriate for this type of study.

There is a basic study assumption that a 6-log kill of spores is the appropriate target for room decontamination. A 6-log kill is definitely appropriate for terminal sterilization of critical medical devices if the devices are used in normally sterile body sites.[2] The goal of room decontamination is significantly different: to eliminate potentially pathogenic microorganisms contaminating room surfaces.

The Holmdahl et al[1] study used biological indicators with a 6-log concentration of *Geobacillus* spores in a Tyvek pouch. A packaged 6-log biological indicator configuration is appropriate and commonly used for terminal sterilization, but it is not consistent with the goal of room decontamination and presents an unduly high level of challenge. It is our opinion that employing the requirements for terminal sterilization is not appropriate and does not serve the user community well.

Literature and surface sampling performed in hospital rooms with contact plates or swab samples has revealed that real-life contamination of hospital room surfaces after cleaning rarely exceeds a 2-log concentration.[3] Overcoming an unreasonably high challenge (a 6-log concentration of *Geobacillus* spores in a Tyvek pouch) requires a higher than necessary dose and concentration of hydrogen peroxide. Higher doses and concentrations of hydrogen peroxide increase the impact to the environment, compared with that of a process that uses a lower concentration and dose of the same active ingredient.

The Glosair System (formerly Sterinis) uses a 5%–6% concentration of peroxide to reduce the environmental risk yet achieves kill levels consistent with known hospital room bioburden levels. We would be glad to work with the study authors to repeat their testing under conditions more representative of real-world conditions.

ACKNOWLEDGMENTS

Potential conflicts of interest. The author reports that he is presently employed by Advanced Sterilization Products, which develops and markets equipment for area decontamination. All authors submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest, and the conflicts that the editors consider relevant to this article are disclosed here.

Charles G. Roberts, MS;

Affiliations: Advanced Sterilization Products, Johnson and Johnson, Irvine, California.

Address correspondence to Charles G. Roberts, MS, Advanced Sterilization Products, Johnson and Johnson, 33 Technology Drive, Irvine, CA 92618 (crobert2@its.jnj.com).

Infect Control Hosp Epidemiol 2012;33(3):312

© 2012 by The Society for Healthcare Epidemiology of America. All rights reserved. 0899-823X/2012/3303-0019$15.00. DOI: 10.1086/664043

REFERENCES

1. Holmdahl T, Lanbeck P, Wullt M, Walder MH. A head-to-head comparison of hydrogen peroxide vapor and aerosol room decontamination systems. *Infect Control Hosp Epidemiol* 2011;32(9): 831–836.
2. Rutala WA, Weber DJ. Cleaning, disinfection and sterilization. In: Carrico R, ed. *APIC Text of Infection Control and Epidemiology.* Washington DC: Association for Professionals in Infection Control and Epidemiology, 2009:21:1–21.
3. Association for the Advancement of Medical Instrumentation. *Comprehensive Guide to Steam Sterilization and Sterility Assurance in Health Care Facilities.* ANSI/AAMI ST79, 2006, A1:2008 and A2:2009.

Reply to Roberts

To the Editor—In his letter, Roberts[1] makes some interesting remarks pertaining to our study,[2] which may initiate an important discussion. We agree with Roberts that "the goal of room decontamination ... is to eliminate potentially pathogenic microorganisms contaminating room surfaces."[1,p.xxx] Indeed, proposed standards for hospital hygiene specify the absence of known pathogens from surfaces as the intended goal of hospital disinfection.[3] One of the systems that we tested is reported not to eradicate pathogens from hospital surfaces and is associated with less than a 6-log reduction in vitro.[4-6] Thus, we believe that a 6-log inactivation of *Geobacillus stearothermophilus* spores as biological indicators is an appropriate target for room decontamination because it correlates with the elimination of pathogens.[7]

Roberts[1] makes the point that the concentration of contamination on hospital surfaces is usually in the 2-log range. It would be expected, therefore, that the 2 systems would eradicate pathogens from surfaces, because they achieve a higher log-reduction in vitro than the concentration of contamination typically found on hospital surfaces.[4,6] However, this is not always the case.[4-6] There could be several reasons

https://doi.org/10.1086/664044 Published online by Cambridge University Press

for this. First, soiling with organic matter and the presence of biofilms increases the resistance of microbes to disinfection. Second, certain organisms have lower susceptibility to a given disinfectant than do other organisms. An in vitro study showed that catalase-producing vegetative bacteria, including methicillin-resistant *Staphylococcus aureus* (MRSA) and *Acinetobacter baumannii*, had a lower susceptibility to hydrogen peroxide than did *Clostridium difficile* spores.[8] Third, although the concentration of contamination on hospital surfaces is usually in the 2-log range, higher levels of contamination have been reported.[9] Finally, our study showed incomplete distribution from one of the systems.[10] This means that some areas of a hospital room get a lower dose of hydrogen peroxide than do other areas, which could contribute to the fact that log reductions achieved in vitro are not realized in all parts of the room. There is perhaps a parallel with liquid cleaning and disinfectants, in which more than a 2-log reduction in vitro does not eradicate pathogens because of limitations in achieving adequate distribution and contact time.

Routine microbiological culture of the environment is time consuming and expensive. However, the inactivation of 6-log biological indicators provides a safe, practical means for validating the effectiveness of automated room disinfection systems and has been shown to correlate well with the elimination of pathogens from hospital surfaces.

ACKNOWLEDGMENTS

Potential conflicts of interest. All authors report no conflicts of interest relevant to this article. All authors submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest, and the conflicts that the editors consider relevant to this article are disclosed here.

Mats Walder, MD, PhD; Torsten Holmdahl, MD;

Affiliations: Infectious Disease Unit, Department of Clinical Sciences, Lund University, Malmö, Sweden.

Address correspondence to Mats Walder, MD, PhD, Medical Microbiology, Department of Laboratory Medicine, Lund University, Malmö, Skåne University Hospital SUS, SE-20502, Sweden (mats.walder@med.lu.se).

Infect Control Hosp Epidemiol 2012;33(3):312-313

© 2012 by The Society for Healthcare Epidemiology of America. All rights reserved. 0899-823X/2012/3303-0020$15.00. DOI: 10.1086/664044

REFERENCES

1. Roberts CG. Hydrogen peroxide vapor and aerosol room decontamination systems. *Infect Control Hosp Epidemiol* 2012;33: 312 (in this issue).
2. Holmdahl T, Lanbeck P, Wullt M, Walder MH. A head-to-head comparison of hydrogen peroxide vapor and aerosol room decontamination systems. *Infect Control Hosp Epidemiol* 2011; 32(9):831–836.
3. Dancer SJ. How do we assess hospital cleaning? a proposal for microbiological standards for surface hygiene in hospitals. *J Hosp Infect* 2004;56:10–15.
4. Barbut F, Menuet D, Verachten M, Girou E. Comparison of the efficacy of a hydrogen peroxide dry-mist disinfection system and sodium hypochlorite solution for eradication of *Clostridium difficile* spores. *Infect Control Hosp Epidemiol* 2009;30:515–517.
5. Shapey S, Machin K, Levi K, Boswell TC. Activity of a dry mist hydrogen peroxide system against environmental *Clostridium difficile* contamination in elderly care wards. *J Hosp Infect* 2008; 70:136–141.
6. Boyce JM. New approaches to decontamination of rooms after patients are discharged. *Infect Control Hosp Epidemiol* 2009;30: 515–517.
7. Boyce JM, Havill NL, Otter JA, et al. Impact of hydrogen peroxide vapor room decontamination on *Clostridium difficile* environmental contamination and transmission in a healthcare setting. *Infect Control Hosp Epidemiol* 2008;29:723–729.
8. Otter JA, French GL. Survival of nosocomial bacteria and spores on surfaces and inactivation by hydrogen peroxide vapor. *J Clin Microbiol* 2009;47:205–207.
9. Sexton JD, Tanner BD, Maxwell SL, Gerba CP. Reduction in the microbial load on high-touch surfaces in hospital rooms by treatment with a portable saturated steam vapor disinfection system. *Am J Infect Control* 2011;39:655–662.
10. Holmdahl T, Lanbeck P, Wullt M, Walder MH. A head-to-head comparison of hydrogen peroxide vapor and aerosol room decontamination systems. *Infect Control Hosp Epidemiol* 2011; 32: 831–836.

Analysis of Hip and Knee Arthroplasty Surgical Site Infection Data in Western Australia: Null Effect of Stratification by Procedure Type

To the Editor—In a recently published article on surgical site infection (SSI) following hip arthroplasty, Worth et al[1] recommended stratification between primary and revision procedures when reporting infection rates, to account for centers with divergent numbers of each procedure type. This recommendation was based on a review of cumulative data (2003–2010) collected by the Victorian Hospital Acquired Infection Surveillance System Coordinating Centre, showing a greater risk of SSI after revision hip arthroplasty, compared with the risk after primary hip arthroplasty.[1]

Healthcare Infection Surveillance Western Australia (HISWA) has collected SSI data for both hip and knee arthroplasty since its inception in 2005. Classification of procedure type as primary or revision is part of this data set. Data for infection rates (stratified by procedure type) are reported annually; however, a detailed comparative analysis of primary and revision SSI rates is not included in this report. In light of the recommendation of Worth et al,[1] a review of HISWA hip and knee SSI data was conducted.

For the analysis of hip SSI data, hospitals that had not conducted any revision procedures for the period 2005–2010 were excluded from the analysis, leaving data from 15 hos-

https://doi.org/10.1086/664044 Published online by Cambridge University Press