



ELSEVIER

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Letters to the Editor

Evaluation of novel chemical additive that colorizes chlorine-based disinfectants to improve visualization of surface coverage

To the Editor:

Suboptimal application of disinfectants is a common problem in health care facilities. Several studies have demonstrated that only about half of high-touch surfaces in hospital rooms are typically wiped during postdischarge cleaning.¹⁻³ With monitoring and feedback, thoroughness of cleaning can be significantly improved.¹⁻³ An additional strategy to improve the thoroughness of cleaning might be to enhance the visibility of disinfectants such that environmental services personnel can easily visualize sites where disinfectant has been applied and sites that have been missed.

Highlight (Kinno Inc, Brooklyn, NY) is a novel chemical additive designed to temporarily colorize chlorine-based disinfectants to improve visualization of surface coverage. When added to chlorine-based liquid disinfectants, the chemical interacts with the disinfectant to produce a bright blue color that persists for 5 hours in solution, but that fades to undetectable within ~5 minutes when applied to surfaces. The chemical additive is currently available as a powder that is added to liquid chlorine disinfectants, but a product intended for use with pre-prepared wipes is in development. Although the product was designed to improve visualization of bleach sprayed onto personal protective equipment used in the care of patients with Ebola virus infection, it also could potentially be used to improve environment disinfection.

We conducted experiments to determine whether the additive alters the efficacy of a commercial bleach product containing 0.65% sodium hypochlorite. Using the American Society for Testing and Materials standard quantitative carrier disk test method (No. E2197-02),⁴ we found that the presence of the chemical additive had no adverse influence on the effectiveness of the commercial bleach product against *Clostridium difficile* spores (~6 log₁₀ CFU reduction in spore recovery with 5-minute exposure with or without the additive).

To test visibility, 9 health care personnel participated in a blinded comparison of their ability to identify sites sprayed with the commercial bleach product with or without the addition of Highlight. For this assessment, several real-world surfaces (eg, tan bedside table, bed rail, and black benchtop) were divided into sections that were randomly assigned to be sprayed with the bleach product

with versus without Highlight. The surfaces were assessed within 30 seconds of spray application and again after 3 minutes. The percentage of sites correctly identified by personnel as having or not having bleach application was compared for bleach with or without the additive using 1-way analysis of variance. As shown in Figure 1, except for the black surface, the addition of Highlight to sodium hypochlorite solution increased the ability of personnel to correctly identify sites of bleach application when tested within 30 seconds of application. The results were similar when testing was performed 3 minutes after application of the bleach products. Figure 1 also provides an illustration of bleach versus bleach-plus-Highlight sprayed onto a bed rail. Highlight faded to undetectable on most surfaces, but did leave a light-blue residue on textured surfaces and in crevices that was easily removed with a moist wipe.

Our results suggest that addition of Highlight to chlorine-based disinfectants could increase the ability of personnel to identify sites of application for up to 3 minutes without adversely affecting efficacy against pathogens. Highlight could be useful during environment cleaning training sessions or potentially as a routine additive for all manual cleaning with chlorine-based disinfectants. Additional studies are needed to determine whether use of the product will result in improved cleaning by environmental services personnel. Finally, work is needed to determine whether similar additives can be developed for other disinfectants used in health care facilities.

References

1. Carling PC, Bartley JM. Evaluating hygienic cleaning in health care settings: what you do not know can harm your patients. *Am J Infect Control* 2010;38:S41-50.
2. Deshpande A, Donskey CJ. Practical approaches for assessment of daily and post-discharge room disinfection in healthcare facilities. *Curr Infect Dis Rep* 2017;19:32.
3. Sitzlar B, Deshpande A, Fertelli D, Kundrapu S, Sethi AK, Donskey CJ. An environmental disinfection odyssey: evaluation of sequential interventions to improve disinfection of *Clostridium difficile* isolation rooms. *Infect Control Hosp Epidemiol* 2013;34:459-65.
4. American Society for Testing and Materials International. Designation E2197: standard quantitative disk carrier test method for determining bactericidal, virucidal, fungicidal, mycobactericidal, and sporicidal activities of chemicals. West Conshohocken, PA: ASTM International; 2011.

Funding/support: Supported by Merit Review grant No. 1 I01 BX002944-01A1 from the Department of Veterans Affairs to CJD. Kinno Inc provided the product for testing, but did not participate in design of the experiments, analysis or interpretation of the data, or writing of the manuscript.

Conflicts of interest: CJD has received research grants from Merck, GOJO, STERIS, and EcoLab and serves on advisory boards for 3M and Synthetic Biologics.

Aishat Mustapha, BS
Case Western Reserve University School of Medicine, Cleveland, OH

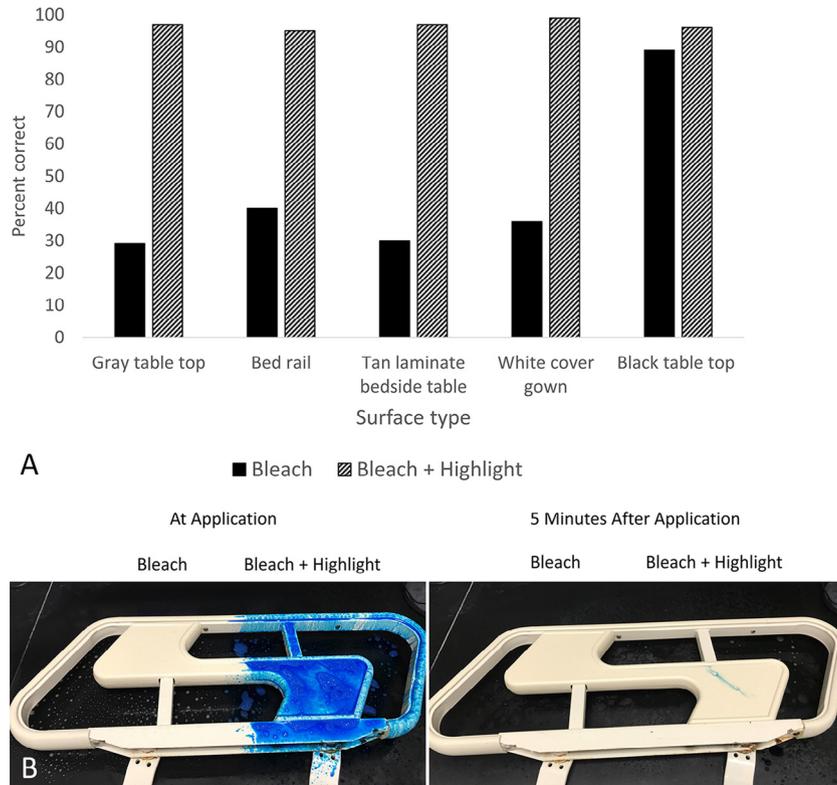


Fig 1. (A) Percentage of sites correctly identified by personnel as having or not having bleach application when testing occurred within 30 seconds of application, stratified based on whether Highlight solution (Kinnos Inc, Brooklyn, NY) was added to colorize the bleach solution. (B) Image of a bed rail with application of bleach versus bleach-plus-Highlight.

Jennifer L. Cadnum, BS
 Research Service, Louis Stokes Cleveland Veterans Affairs
 Medical Center

Heba Alhmidi, MD
 Research Service, Louis Stokes Cleveland Veterans Affairs Medical
 Center, Cleveland, OH

Curtis J. Donskey, MD*
 Case Western Reserve University School of Medicine, Cleveland, OH

Geriatric Research, Education and Clinical Center, Louis Stokes
 Veterans Affairs Medical Center, Cleveland, OH

* Address correspondence to Curtis J. Donskey, MD, Geriatric
 Research, Education, and Clinical Center, Louis Stokes Veterans
 Affairs Medical Center, 10701 East Blvd, Cleveland, OH 44106.
 E-mail address: Curtis.Donskey@va.gov (C.J. Donskey).

<https://doi.org/10.1016/j.ajic.2017.09.019>