Assessment of an innovative antimicrobial surface disinfectant in the operating room environment using adenosine triphosphate bioluminescence assay


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Adenosine triphosphate bioluminescence assay
Isopropyl alcohol/organofunctional silane solution
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Terminal cleaning in the operating room is a critical step in preventing the transmission of health care–associated pathogens. The persistent disinfectant activity of a novel isopropyl alcohol/organofunctional silane solution (ISO) was evaluated in 4 operating rooms after terminal cleaning. Adenosine triphosphate bioluminescence documented a significant difference ($P < .048$) in surface bioburden on ISO-treated surfaces versus controls. RODAC plate cultures revealed a significant ($P < .001$) reduction in microbial contamination on ISO-treated surfaces compared with controls. Further studies are warranted to validate the persistent disinfectant activity of ISO within selective health care settings.

DISCLAIMER: The results, statements, and commentary in this article are the expressed opinions of the authors.

Conflicts of interest: None to report.

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Colonies were assessed as fair to moderate, and viewed as poor or significant contamination. At the end of the 6-week study period (N = 720), 70% of OR test surfaces were culture positive, whereas 82.5% of IOS-treated surfaces were culture negative. The mean microbial recovery (colony forming units) from nontreated sites was 297.5, whereas 80.1% of IOS-treated surfaces were culture negative. The mean microbial recovery (colony forming units) from nontreated and IOS-treated culture-positive sites were coagulase-negative staphylococci and Micrococcus sp. No significant degradation of antimicrobial activity based on BBL RODAC plate cultures was noted in the IOS-treated sites over the 6-week test interval.

**CONCLUSION**

The terminal cleaning process is a critical step in preventing the transmission of health-care–associated pathogens. Baseline analysis (Table 1) documented multiple sites within the sampled ORs with ≥46 RLUs, suggesting inadequate terminal cleaning. ATP bioluminescence assay has been proposed as a surrogate marker for measuring the effectiveness of the routine cleaning process by documenting the presence of residual ATP. In the present study, ATP bioluminescence assay demonstrated a significant reduction (P = .048) in RLUs on inert surfaces treated with an innovative antimicrobial IOS compared with nontreated control surfaces. However, ATP bioluminescence does not differentiate between microbial and nonmicrobial (blood and tissue protein) surface bioburden. Therefore, BBL RODAC plates were used to validate the disinfectant activity of IOS, demonstrating a significant reduction (P < .001) in microbial surface contamination on all test surfaces over the 6-week study period compared with control surfaces. Selective IOS-treated OR surfaces (ie, monitors, keyboards) revealed mean RLU readings ≥46, which would designate the surface as dirty. However, these elevated RLU values likely represented residual nonmicrobial (blood and body fluid) bioburden. ATP bioluminescence technology was effective in assessing surface bioburden contamination after routine terminal cleaning. These results are in agreement with previous published studies documenting the benefit of ATP bioluminescence technology to assess the efficacy of surface cleanliness within the health care environment.

The findings of this study suggest that a single application of IOS provides a persistent disinfectant activity, minimizing microbial surface contamination in an environment where terminal cleaning may be inadequate or have limited effectiveness. These results, however, are in contrast with a recently published article by Boyce.
et al\textsuperscript{11}, suggesting that selective organosilane compounds may not provide a sustained antimicrobial activity when applied to high-touch surfaces within the hospital environment. Unfortunately, these agents were not available to the authors for comparative analysis. Further studies are warranted to validate the persistent disinfectant activity of IOS within selective health care settings.

References