Sensitivity Analysis and Visualization of Biofilms of Clinically Relevant Bacteria Exposed to Disinfectants

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ABSTRACT

Objective: In clinical settings, surface disinfection represents one of the primary means by which the spread of infection is minimized. The main objectives of this study are to examine the effectiveness of disinfectants on clinically relevant bacterial isolates and to determine the role of commercially available disinfectants on these isolates to monitor the death of the cells.

Methods: (A) planktonic and (B) biofilms. (A) A 1.25% solution of sodium hypochlorite (NaOCl) was prepared, and plates were inoculated with a 1:100 dilution of the test organism. The MIC and MBEC were measured to calculate the minimum disinfectant concentration needed to ensure that culture did not grow to over 10% of its maximum capacity. The MICs were determined as the lowest concentration of active ingredients than MIC and MBEC for clinically relevant bacteria. Overall, the MIC and MBEC of the commercial products demonstrated lower concentrations of active ingredients than MIC and MBEC for P. aeruginosa and S. aureus. Each strain exhibited different susceptibility profiles to the test disinfectants; however, glutaraldehyde and sodium hypochlorite were generally the most resistant to the test disinfectants and produced, while biofilm of the clinical isolates of S. aureus and S. epidermidis were generally the most sensitive to the test disinfectants, with the exception of glutaraldehyde and sodium hypochlorite.

RESULTS

Table 1. MIC and MBEC Values for S. subtilis H942

Table 2. MIC and MBEC Values for P. aeruginosa MPAO1

Table 3. MIC and MBEC Values for E. coli Clinical Isolate

Table 4. MIC and MBEC Values for S. aureus Clinical Isolate

CONCLUSIONS

Biofilm resistance is a major concern in the field of antimicrobial susceptibility testing. Disinfectants are often used to control the spread of infectious agents and biofilms. This is the first study that examined the effects of disinfectants on biofilms in the presence of standard test methods. The MIC and MBEC of the commercial products demonstrated lower concentrations of active ingredients than MIC and MBEC for P. aeruginosa and S. aureus. Each strain exhibited different susceptibility profiles to the test disinfectants; however, glutaraldehyde and sodium hypochlorite were generally the most resistant to the test disinfectants and produced, while biofilm of the clinical isolates of S. aureus and S. epidermidis were generally the most sensitive to the test disinfectants, with the exception of glutaraldehyde and sodium hypochlorite.

REFERENCES


INTRODUCTION

The use of disinfectants and biofilms is the primary means of controlling colonization and disinfectant-resistant strains of multiple organisms. The primary goal of the present study is to determine the effects of disinfectants on biofilms. The recent development of a device to study biofilms and determine the MBEC High-throughput (HTP) assay instructions. A microplate reader was used to determine the minimum disinfectant concentration needed to ensure that culture did not grow to over 10% of its maximum capacity. The MICs were determined as the lowest concentration of active ingredients than MIC and MBEC for P. aeruginosa and S. aureus. Each strain exhibited different susceptibility profiles to the test disinfectants; however, glutaraldehyde and sodium hypochlorite were generally the most resistant to the test disinfectants and produced, while biofilm of the clinical isolates of S. aureus and S. epidermidis were generally the most sensitive to the test disinfectants, with the exception of glutaraldehyde and sodium hypochlorite.

METHODS

Fig. 1 Planktonic and biofilm cultures in standardized test methods. Images of planktonic and biofilm cultures in standardized test methods. (A) A 1.25% solution of sodium hypochlorite (NaOCl) was prepared, and plates were inoculated with a 1:100 dilution of the test organism. The MIC and MBEC were measured to calculate the minimum disinfectant concentration needed to ensure that culture did not grow to over 10% of its maximum capacity. The MICs were determined as the lowest concentration of active ingredients than MIC and MBEC for P. aeruginosa and S. aureus. Each strain exhibited different susceptibility profiles to the test disinfectants; however, glutaraldehyde and sodium hypochlorite were generally the most resistant to the test disinfectants and produced, while biofilm of the clinical isolates of S. aureus and S. epidermidis were generally the most sensitive to the test disinfectants, with the exception of glutaraldehyde and sodium hypochlorite.

Fig. 2 MBEC device. Biofilm was grown on a polyp (A) that was implanted in a polyvinyl chloride (PVC) tube. Images of MBEC device. (A) Biofilm was grown on a polyp that was implanted in a polyvinyl chloride (PVC) tube. The MBEC High-throughput (HTP) assay instructions. A microplate reader was used to determine the minimum disinfectant concentration needed to ensure that culture did not grow to over 10% of its maximum capacity. The MICs were determined as the lowest concentration of active ingredients than MIC and MBEC for P. aeruginosa and S. aureus. Each strain exhibited different susceptibility profiles to the test disinfectants; however, glutaraldehyde and sodium hypochlorite were generally the most resistant to the test disinfectants and produced, while biofilm of the clinical isolates of S. aureus and S. epidermidis were generally the most sensitive to the test disinfectants, with the exception of glutaraldehyde and sodium hypochlorite.

Fig. 3 Planktonic and biofilm cultures in standardized test methods. Images of planktonic and biofilm cultures in standardized test methods. (A) A 1.25% solution of sodium hypochlorite (NaOCl) was prepared, and plates were inoculated with a 1:100 dilution of the test organism. The MIC and MBEC were measured to calculate the minimum disinfectant concentration needed to ensure that culture did not grow to over 10% of its maximum capacity. The MICs were determined as the lowest concentration of active ingredients than MIC and MBEC for P. aeruginosa and S. aureus. Each strain exhibited different susceptibility profiles to the test disinfectants; however, glutaraldehyde and sodium hypochlorite were generally the most resistant to the test disinfectants and produced, while biofilm of the clinical isolates of S. aureus and S. epidermidis were generally the most sensitive to the test disinfectants, with the exception of glutaraldehyde and sodium hypochlorite.

Fig. 4 MBEC device. Inoculum was grown on a polyp (A) that was implanted in a polyvinyl chloride (PVC) tube. Images of MBEC device. (A) Inoculum was grown on a polyp that was implanted in a polyvinyl chloride (PVC) tube. The MBEC High-throughput (HTP) assay instructions. A microplate reader was used to determine the minimum disinfectant concentration needed to ensure that culture did not grow to over 10% of its maximum capacity. The MICs were determined as the lowest concentration of active ingredients than MIC and MBEC for P. aeruginosa and S. aureus. Each strain exhibited different susceptibility profiles to the test disinfectants; however, glutaraldehyde and sodium hypochlorite were generally the most resistant to the test disinfectants and produced, while biofilm of the clinical isolates of S. aureus and S. epidermidis were generally the most sensitive to the test disinfectants, with the exception of glutaraldehyde and sodium hypochlorite.