Evaluation of the antimicrobial activity of a surface coating against different pathogens

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Introduction

The survival and spread of resistant foodborne and nosocomial-associated bacteria through high-touch surfaces is not always prevented by the employment of cleaning protocols. Antimicrobial surface coatings surge from the need to eradicate pathogenic bacteria and prevent future infections and even outbreaks.

Objectives

This study aimed to characterize a novel quaternary ammonium compound based coating in terms of its kinetics, and durability and to evaluate its antimicrobial activity against important pathogens on different surface materials.

Methods

Antimicrobial surface coating efficacy, killing contact time and durability

Polyvinyl chloride (PVC)
Glass
Stainless steel

Escherichia coli
Acinetobacter baumannii
Listeria monocytogenes

ISO 22196:2011

Conclusions

After a 1-minute contact-time bacterial growth was inhibited in all treated surfaces. Antimicrobial activity of the product was proven. Its durability was less than reported by the manufacturer.

Although promising by a significant reduction of surfaces contamination, the studied novel antimicrobial coating should be further evaluated. First, the employment of standard protocols that mimic real-life conditions would better validate its antimicrobial efficacy. Determining its effective durability is also a critical point that deserves attention in future studies.

Results and discussion

Antimicrobial activity, kinetics and durability

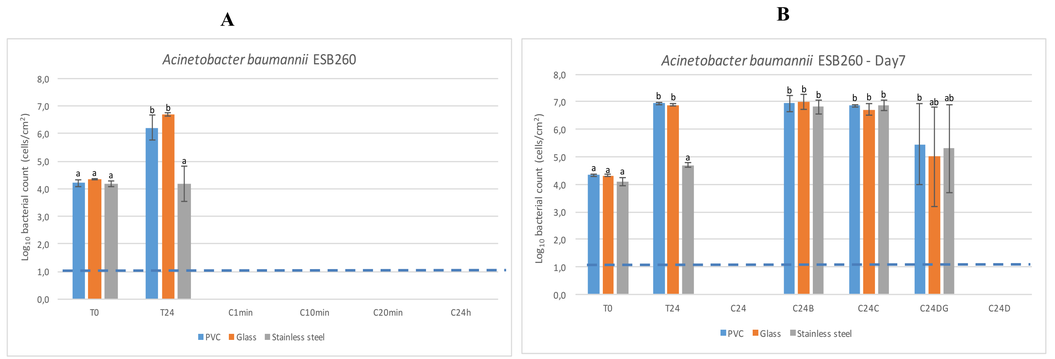

Figure 1. A) Contact killing time for *A. baumannii*. Recovery of bacteria immediately after inoculation (T0); after 24h incubation (T24) on untreated surfaces; Recovery of bacteria immediately after inoculation (C1min); after 10 minutes (C10min), 20 minutes (C20min) and 24h incubation (C24h) on each treated surface. **B)** Antimicrobial activity of the compound on day 7 for *A. baumannii*. Recovery of bacteria immediately after inoculation (T0); after 24h incubation (T24) on untreated surface; after 24h incubation (C24B) on treated surface cleaned with bleach; 24h incubation (C24C) on treated surface cleaned with damp cloth; 24h incubation (C24DG) on treated surface cleaned with commercial degreaser and 24h incubation (C24D) on treated surface cleaned with commercial disinfectant.

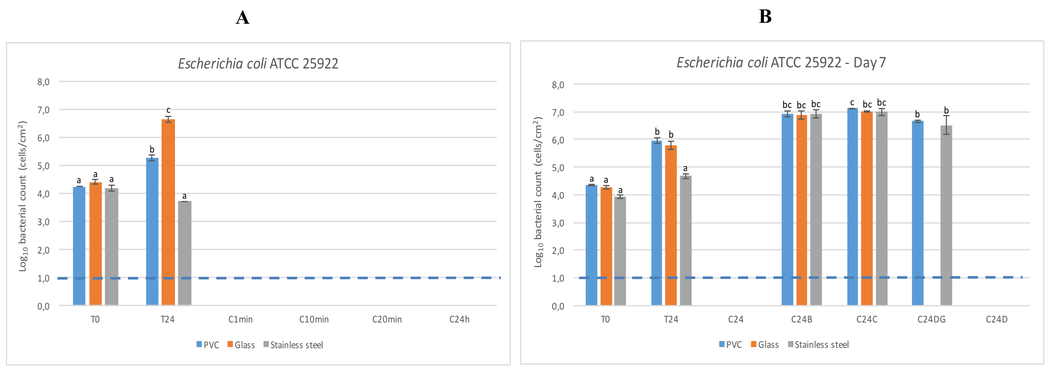

Figure 2. A) Contact killing time for *E. coli*. Recovery of bacteria immediately after inoculation (T0); after 24h incubation (T24) on untreated surfaces; Recovery of bacteria immediately after inoculation (C1min); after 10 minutes (C10min), 20 minutes (C20min) and 24h incubation (C24h) on each treated surface. **B)** Antimicrobial activity of the compound on day 7 for *E. coli*. Recovery of bacteria immediately after inoculation (T0); after 24h incubation (T24) on untreated surface; after 24h incubation (C24B) on treated surface cleaned with bleach; 24h incubation (C24C) on treated surface cleaned with damp cloth; 24h incubation (C24DG) on treated surface cleaned with commercial degreaser and 24h incubation (C24D) on treated surface cleaned with commercial disinfectant.

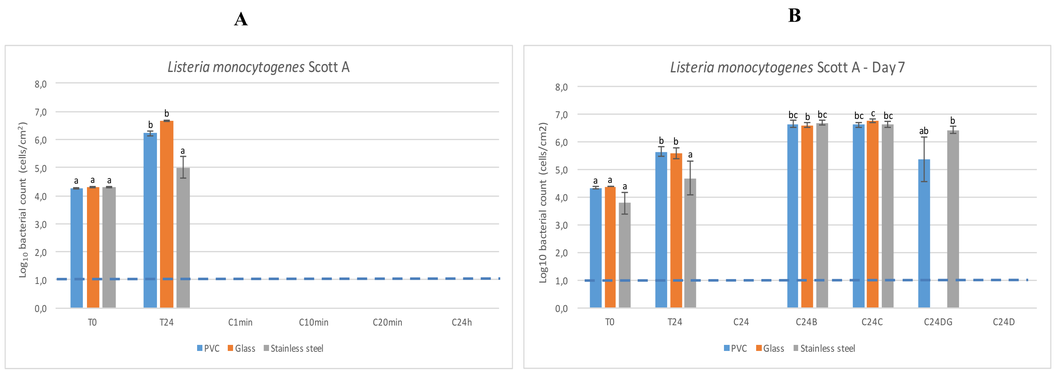

Figure 3. A) Contact killing time for *L. monocytogenes*. Recovery of bacteria immediately after inoculation (T0); after 24h incubation (T24) on untreated surfaces; Recovery of bacteria immediately after inoculation (C1min); after 10 minutes (C10min), 20 minutes (C20min) and 24h incubation (C24h) on each treated surface. **B)** Antimicrobial activity of the compound on day 7 for *L. monocytogenes*. Recovery of bacteria immediately after inoculation (T0); after 24h incubation (T24) on untreated surface; after 24h incubation (C24B) on treated surface cleaned with bleach; 24h incubation (C24C) on treated surface cleaned with damp cloth; 24h incubation (C24DG) on treated surface cleaned with commercial degreaser and 24h incubation (C24D) on treated surface cleaned with commercial disinfectant.

Growth inhibition for all three tested pathogens was observed after a 1-minute contact with the treated surfaces for all surfaces tested (PVC, glass and stainless steel) (Figures 1A, 2A and 3A). Short contact killing time may be due to the fact that bacterial adhesion is inhibited being the cell lysed before attaching to the surface.

Antimicrobial activity (R) was assessed and compared to the control (T24). Durability of the antimicrobial activity on the treated surfaces was shown to be less than 7 days after surface cleaning having no growth been observed for all treated surfaces cleaned with a commercial disinfectant and for glass surfaces cleaned with a commercial degreaser for *E. coli* and *L. monocytogenes*.

References

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