INVESTIGATING THE SHORT-TERM MODE OF ACTION OF MICROBIAL-BASED CLEANING PRODUCTS

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INTRODUCTION

Microbial-Based Cleaning Products (MBCPs) (sometimes called probiotic cleaners) are classed as green technology cleaners and are believed to improve the cleaning of kitchen worktops, floors and other surfaces [1]. However, currently, there is no standardised method to assess their safety in relation to their impact on the human microbiome and the microbial species used in product formulation are often not specifically mentioned in product labelling.

AIM

In order to understand the potential consequences of the microbial species interactions with domestic surfaces and the human microbiome, they need first to be identified and their impact on pathogens characterised. The aim of the current study is to isolate and characterise the viable microbial species present in 8 MBCPs (P1 to P8) and to study their effect on selected human pathogens - *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa*.

METHODS

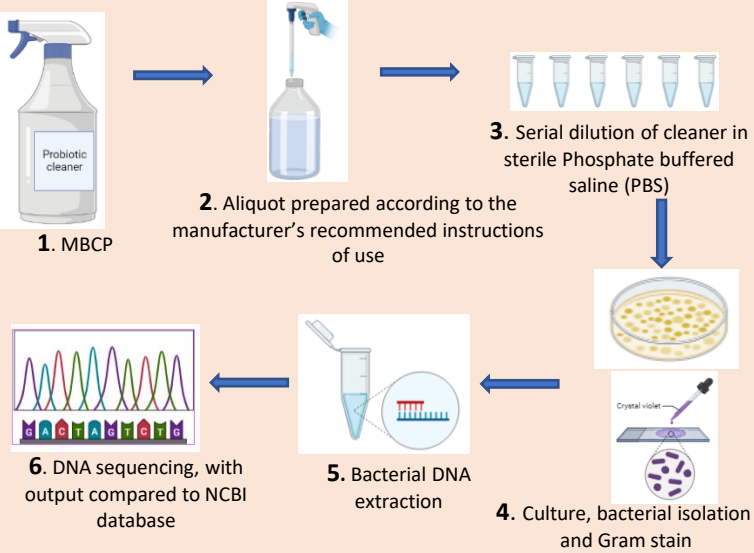

Figure 1: Schematic diagram to show the isolation and identification of microorganisms from MBCPs.

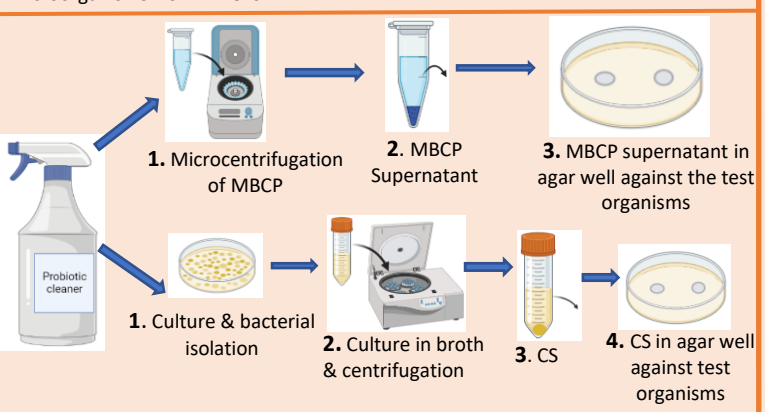

Figure 2: Methodology for evaluating the effects of MBCP supernatants and culture supernatants (CS) on *S. aureus, E. coli*, and *P. aeruginosa*.

RESULTS

1. Gram staining of MBCP cultures shows the presence of Gram-positive bacteria.

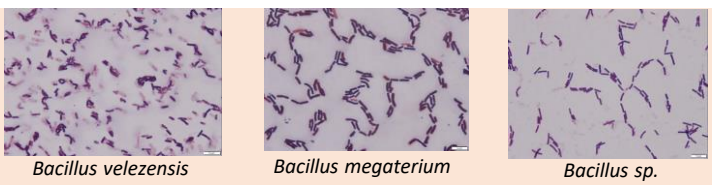

Figure 3: Gram staining showing some isolates from MBCPs.

2. 16s rRNA sequencing revealed mostly *Bacillus* spp. present in the tested MBCPs

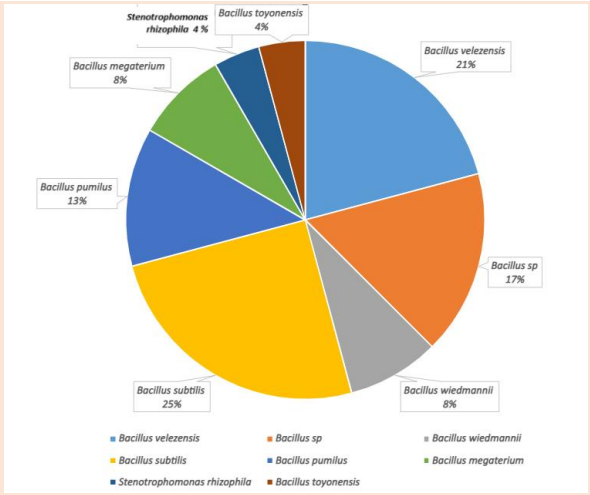

Figure 4: Chart shows the percentage occurrence of identified isolates from the tested MBCPs (n = 8).

3. MBCP supernatants show varied zones of inhibition against *E. coli*, *S. aureus* and *P. aeruginosa*

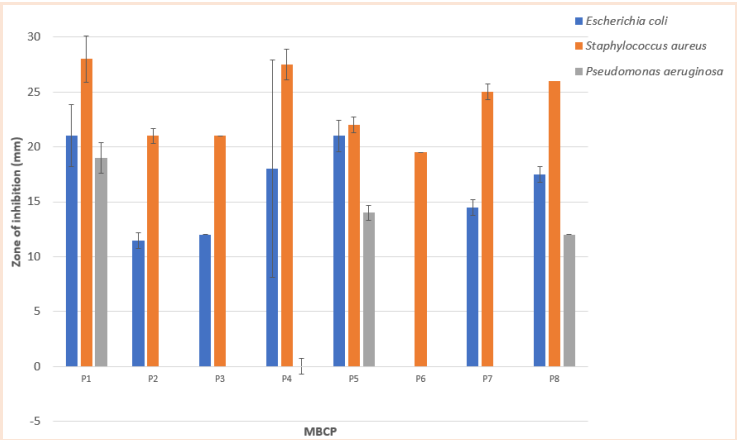

Figure 5: MBCPs supernatant effect against *E. coli*, *S. aureus* and *P. aeruginosa.* The x-axis represents each MBCP from P1 to P8. The y-axis represents the mean zone of inhibition (mm) for each of the tested products against *E. coli* (Blue), *S. aureus* (orange) and *P. aeruginosa* (grey) on the bar chart.

4. Culture supernatant of *B. velezensis* (isolated from P7), and *B. subtilis* (from P2, P6, & P7) inhibits the growth of *S. aureus* while culture supernatant of *B. pumilus* (from P8) inhibits the growth of both *S. aureus* and *E. coli*

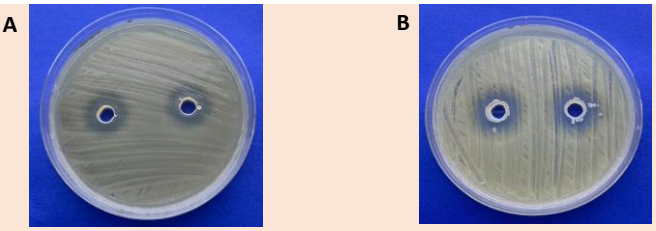

Figure 6: The 8 mm hole on the agar shows clear zones of inhibition on Mueller-Hinton Agar (MHA) plates containing bacterial lawn of *E. coli* (A) and *S. aureus* (B).

CONCLUSION

- Viable bacteria were isolated from MBCPs using culture-based techniques.
- The supernatants from MBCPs and culture supernatants of *B. velezensis*, *B. subtilis*, and *B. pumilus* from MBCPs can inhibit *E. coli* and *S. aureus*, suggesting an antimicrobial effect of these isolates against important clinical human pathogens.
- The identification of *Bacillus* isolates from MBCPs with antimicrobial properties and on surfaces treated with MBCPs will enable us to assess their impact on safety.

REFERENCE

1. Subasinghe, R. M., Samarajeewa, A. D., Meier, M., Coleman, G., Clouthier, H., Crosthwait, J., Tayabali, A. F., Scroggins, R., Shwed, P. S., & Beaudette, L. A. (2018). Bacterial and fungal composition profiling of microbial based cleaning products. *Food and Chemical Toxicology*, *116*, 25–31. https://doi.org/10.1016/J.FCT.2017.12.006

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