



Investigating the Antimicrobial Efficacy of Commercially Available Electrostatic Sprayers on Food Contact Surfaces



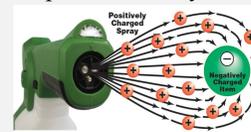
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Introduction

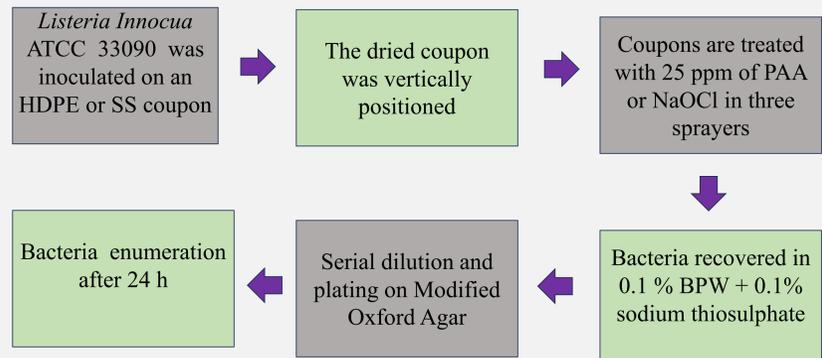
- 37.3% of 228 produce-related foodborne outbreaks occurred in multiple states. These foodborne outbreaks, associated with produce contamination, led to 4748 illnesses, 1190 hospitalizations, and 55 deaths from 2010 to 2017
- Cross-contamination of fresh produce can occur from food contact surfaces (FCS) that could serve as reservoirs of pathogens, such as *Listeria monocytogenes*
- Effective sanitation practices are needed to improve fresh produce safety
- Electrostatic spray technology can evenly distribute sanitizers onto surfaces, including hidden areas, making it a possible option to address improper sanitation gaps
- However, the electrostatic spraying of commonly used food-grade chemical sanitizers on food contact surfaces is still underexplored
- Therefore, our study focused on determining the efficacy of a commercially available electrostatic sprayer on food contact surfaces compared to conventional spraying



Research Objective

To evaluate the efficacy of commercially available electrostatic spraying of peracetic acid (PAA) or sodium hypochlorite (NaOCl) on stainless steel (SS) and high-density polyethylene (HDPE) surfaces

Materials and Methods



Results

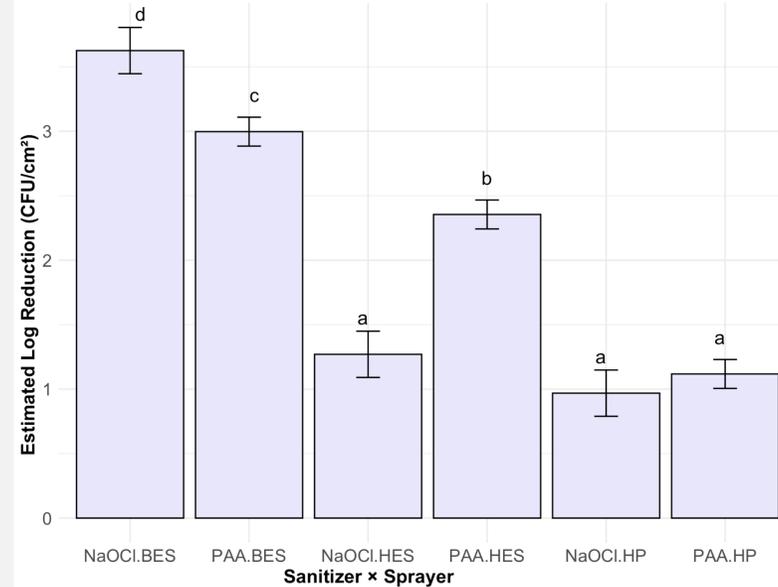


Figure 1: Interaction Effect between Sanitizer and Sprayer

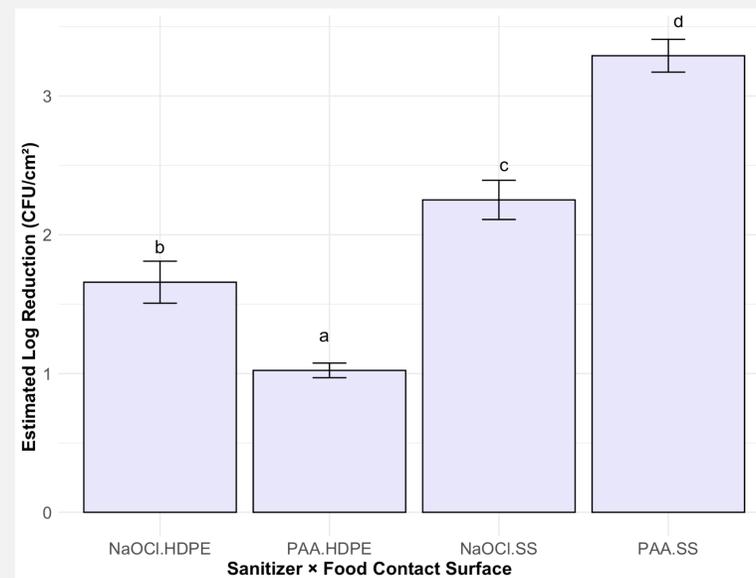


Figure 2: Interaction Effect between Sanitizer and Food Contact Surface

Table 1: Interaction Effect between Food Contact Surface and Sprayer

Surface: Sprayer	Log Reduction (CFU/cm ²)
SS: BES	3.31 ± 0.50 ^a
SS: HES	2.50 ± 0.96 ^b
HDPE: BES	2.37 ± 0.74 ^b
SS: HP	1.41 ± 0.56 ^c
HDPE: HES	0.73 ± 0.46 ^c
HDPE: HP	0.68 ± 0.47 ^c

Discussion

- The use of the backpack electrostatic sprayer with either PAA or NaOCl showed the highest *Listeria* reduction (3.0 or 3.63 log CFU/ cm², respectively) compared to the handheld and hand pump sprayers.
- The hand pump sprayer with PAA or NaOCl showed the lowest microbial log reduction (1.12 or 0.97 log CFU/ cm², respectively)
- Microbial log reduction observed on SS (2.77 log CFU/cm²) was significantly higher compared to that on HDPE (1.34 log CFU/cm²) when the sanitizers were applied onto the surfaces
- Both SS and HDPE are considered non-porous; the sanitizer effects on *Listeria* reduction varied significantly between sanitizers applied onto stainless steel (SS) and high-density polyethylene surfaces (HDPE)
- The highest microbial log reduction (3.29 log CFU/cm²) was observed when PAA was used to decontaminate *Listeria* on the stainless-steel surface
- Generally, electrostatic spraying on SS surfaces led to a higher microbial reduction than on HDPE plastics, possibly due to surface characteristics such as smoothness and hydrophobicity

Conclusion

- Overall, the results indicate that electrostatic spraying (backpack) was more effective in reducing *Listeria* on food contact surfaces, thereby minimizing cross-contamination of fresh produce
- Electrostatic spraying (BES) of a lower sanitizers dose (25ppm) on the food contact surfaces achieved a ≥ 99.9% microbial reduction
- Therefore, electrostatic sprayers can be explored to improve sanitization practices in the fresh produce industry

References

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- Law, S. E., & Cooper, S. C. (2024). Standard Methods for Evaluating Electrostatic Spray Charge and Deposition of Conductive Liquids used for Surface Disinfection. *IEEE Transactions on Industry Applications*.

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