Evaluation of individual and combined antimicrobial spray treatments on chilled beef subprimal cuts to reduce Shiga toxin-producing Escherichia coli populations


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Purpose: This study evaluated the efficacy of three common antimicrobial sprays, individually and combined, against a rifampicin-resistant STEC cocktail (O26, O45, O103, O111, O121, O145, and O157:H7).

Methods: This study evaluated the efficacy of three common antimicrobial sprays, individually (Study 1) and combined (Study 2), against a rifampicin-resistant STEC cocktail (O26, O45, O103, O111, O121, O145, and O157:H7) using a commercial style subprimal spray cabinet. For Study 1, beef subprimals (n=16) were mist-inoculated with the cocktail (ca. 5 log CFU/cm²), followed by spray-treatment with individual antimicrobials [200 ppm peracetic acid (PAA), 2% Centron™ (sulfuric acid, sodium sulfate anhydrous and water mixture; CEN), 4.5% lactic acid (LA), or water (W)].

To test the efficacy of combined treatments on subprimal cuts in Study 2, a split-plot design was used with three replications. The inoculated subprimals (n=16) were first treated with PAA, LA, CEN, or W; vacuum packaged; and stored for 72 hours at 4°C. Each subprimal was then divided (n=16) and treated with each of the four antimicrobials as a second treatment.

The first study was designed as randomized generalized block, and the second study was designed as a split plot. After each treatment phase, microbial analyses were conducted in duplicate to determine STEC reductions.

Results and Conclusions: As individual antimicrobial treatments, LA and PAA provided greater (P ≤ 0.05) STEC reductions (0.5 and 0.6 ± 0.08 log CFU/cm², respectively) compared to water (0.2 ± 0.08 log CFU/cm²), but the CEN reduction (0.4 ± 0.10 log CFU/cm²) was statistically similar to W.

When treatments were combined, cumulative reductions from the two treatments and storage ranged from 0.5 to 1.5 log CFU/cm² (± 0.3 log CFU/cm²); the greatest reduction was observed when subprimals were treated with LA followed by vacuum packaged storage and another LA application. Nevertheless, there was no statistical significance among treatments for a particular combination of treatments in Study 2.

Significance: These studies indicate that the individual antimicrobial treatments evaluated are marginally effective for reducing STEC population on chilled beef subprimal cuts during fabrication.
Their efficacy may be improved by combining treatments when the beef is stored under vacuum packaged conditions and retreated upon bag opening, as typical of mechanical tenderization operations.