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Evaluation of Antimicrobial Interventions Applied to Bob Veal Carcasses Inoculated with Shiga Toxin-Producing Escherichia Coli (Stec) Surrogates before and after Chilling

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Objectives

The United States Department of Agriculture Food Safety Inspection Service reported greater prevalence of Shiga toxin producing *E. coli* (STEC) on veal carcasses and ground veal. Ruminants are natural reservoir of STEC and the microorganisms can easily be transferred to carcasses during the conversion of animals to meat, especially for veal. Literature on efficacy of antimicrobial interventions in reducing STEC populations on veal carcasses is limited. Three experiments were conducted to evaluate lactic acid (4%; LA), peroxyacetic acid (300 ppm; PAA), and hot water (80°C; HW), for their individual and/or combined ability to reduce STEC surrogates on bob veal carcasses pre- and post-chill, and through fabrication.

Materials and Methods

In experiment 1, hot carcasses (n = 9) were inoculated with a 5-strain cocktail (ca. 8 log CFU/ml) containing rifampicin-resistant surrogate *Escherichia coli* (*E. coli*; BAA-1427, BAA-1428, BAA-1429, BAA-1430, and BAA-1431) to simulate carcass contamination during slaughter and then treated with HW, LA, or PAA. Carcasses were chilled (0 ± 1°C) for 24 h, split in halves and each side was treated with LA or PAA. In experiment 2, hot carcasses (n = 3) were inoculated with the 5-strain cocktail and chilled for 24 h. After chilling, carcasses were split and each side was treated with either LA or PAA. For experiment 3, carcasses (n = 3) where chilled for 24 h, split, and then inoculated (simulating post-slaughter contamination) and treated with either LA or PAA. Inoculated carcasses were allowed to rest for 15 min for attachment. Three individual replications were performed, on different days, for all experiments. Experiment 1 was designed as a randomized split-plot with carcass as the whole plot and side as the sub-plot. Experiments 2 and 3 were completely randomized designs with side as the experimental unit. For each experiment, *E. coli* population (log CFU/cm^2) was analyzed using PROC GLM (SAS V.9.4) for the main effects of antimicrobial treatment, sampling time point, and their interaction, when applicable. Means were considered different at $\alpha \leq 0.05$.

Results

Results from experiment one, showed that of the 6 treatment combinations, the collective reductions achieved from; HW+LA, and HW+PAA were 2.88 and 2.07 log CFU/cm^2, respectively; LA+LA and LA+PAA were 3.48 and 2.20 log CFU/cm^2, respectively; and PAA+LA and PAA+PAA were 1.32 and 0.99 log CFU/cm^2, respectively. Of the 6 combinations, LA+LA was the most effective ($P \leq 0.05$) treatment in reducing surrogate *E. coli* on veal. For experiment 2, application of LA and PAA on the chilled carcasses resulted in 0.91 and 0.24 log CFU/cm^2 reductions. Again, LA resulted in greater ($P \leq 0.05$) reductions compared to PAA. However, in experiment 3, there was no difference ($P > 0.05$) between LA and PAA in reducing surrogate *E. coli* when applied to veal carcasses. Measurements on cut surfaces for translocation during fabrication showed that all antimicrobial treatments resulted in undetectable levels (< 0.3 log CFU/cm^2) of surrogate *E. coli* for experiment 1 and 2, and low levels (1.66 and 0.97 log CFU/cm^2 for LA and PAA, respectively) for experiment 3.

Conclusion

Of the antimicrobial interventions utilized, lactic acid was more effective in reducing STEC surrogate populations on veal carcasses, pre- and/or post-chill.

