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Effect of Lactic Acid Treatment on E. coli and Coliform Growth in Ground Beef after Different Storage Periods and Retail Display Days

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Objectives

The study evaluated the changes in of *Escherichia coli* and coliforms counts in ground beef prepared from beef trimmings stored either 24 or 48 h after treatment with a 2–3% lactic acid dip (LA) for 3 storage periods of 7, 14, or 21 d after grinding.

Materials and Methods

Two sets of beef trimmings were dipped with 2 to 3% LA and stored for either 24 or 48 h prior to grinding. Additionally, 2 untreated sets were included as controls (CON), and were not treated with LA. Samples from each of the 4 sets of trim ($n = 84$; 4.54 kg) were ground, vacuum packaged, and further stored and sampled at 7, 14, or 21 d. After storage period was over, samples were re-ground using a 3.175 mm disk and a 25-g sample was collected to represent retail d 0. Three 454 g portions of each sample were placed on a polystyrene tray overwrapped with low-barrier polyvinylchloride film to represent retail d 1, 2, and 3. Packages were displayed in a coffin-style retail case maintained at 2 to 3°C. Packages were respectively sampled every 24 h according to its designated retail display day. A 25-g sample was collected, placed into a filter bag, and 225 mL of buffered peptone water (BPW) was aseptically added. The bag was stomached for 2 min at 230 RPM. Serial dilutions were made from meat rinse in 9 mL tubes of BPW. One mL from the bag or appropriate tube was plated to each EC petrifilm in duplicate. Both coliforms and *E. coli* petrifilm plates were incubated at 36°C ± 1°C. Counts were made at 24 h for coliforms and 48 h for *E. coli*. Counts and duplicate plates were averaged and converted to log CFU/g of ground beef prior to statistical analysis. Data were analyzed using statistical procedures of a 2-way ANOVA. A split-plot design was used with a whole plot as a 2 × 2 factorial of trim age and treatment and subplot of post-grind age.

Results

The Statistical Analysis showed that the coliform concentration increased in function of the storage period 7, 14, 21 d for 24 to 48 h LA treatments and 24 to 48 h control ($P < 0.01$). The average concentration (for coliforms at 7, 14, and 21 d was 2.57, 4.99 and 5.65 log CFU/g, respectively. For *E. coli* the concentration increases at 14 d stored and diminish at 21 d for 24 to 48 h LA treatments and 24 to 48 h control ($P < 0.01$). The average concentration for *E. coli* at 7, 14, and 21 d was 1.47, 1.68 and 1.24 log CFU/g, respectively. Coliforms and *E. coli* concentration increased in function of the retail display (0, 1, 2, and 3 d) on both the LA treatment and the control ($P > 0.05$).

Conclusion

Based on the results, *E. coli* was not reduced in the samples treated with LA at 2 to 3% prior grinding after 7 and 14 d stored. However, an *E. coli* reduction was observed over a period of 21 d. Similarly, coliforms counts were not reduced with the chemical treatment during the storage periods.

