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Evaluation of the Reduction of *Salmonella* Surrogate in Beef Strip Loins at Temperatures Lower Than 54.4°C

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Objectives

According to the CDC, *Salmonella* is a leading cause of gastroenteritis in humans and continues to be significant in relation to public health concerns for the food industry. This may be attributed to inadequate heating/cooking. According to Appendix A to achieve a 6.5-$\log_{10}$ reduction in *Salmonella* the lowest time/temperature that can be utlized is 54.4°C for 112 min. To date there is limited research in utilizing lower temperatures for strip loins to increase juiciness and perceived tenderness. This study evaluated the reduction of *Salmonella* surrogate on strip loins cooked to internal temperatures of 54.4°C or lower to determine if temperatures less than 54.4°C would achieve a 6.5-$\log_{10}$ reduction in accordance with Appendix A.

Materials and Methods

A local company provided their proprietary brine and rub ingredients and raw meat materials for the experiment. A cocktail of 5 stains of *Escherichia coli* (ATCC BAA-1427, 1428, 1429, 1430, 1431) were utilized. These strains are approved by the USDA as surrogates for *Salmonella* for in plant verification studies. Inoculations were prepared by inoculating TSB with each *E. coli* strain and allowed to grow at 37°C for approximately 24 h. Strip loins were dip inoculated with *E. coli* to achieve a 7.5-$\log_{10}$ CFU/g inoculation level on the meat. Strip loins were pumped 15% with a brine solution and then rubbed with the rub. They were then placed into cook-in bags and vacuum-sealed. Packages were placed on a smokehouse trolley in the smokehouse. The combination of temperatures and times held were 54.4°C for 2 and 3 h, 51.7°C for 3 and 5 h, and 48.9°C for 10 and 12 h. Times were determined utilizing a model from the North American Meat Institute. Internal temperatures were continuously monitored utilizing Type-K Thermocouples. Once removed from the smokehouse 1-kg samples were taken from each strip loin and were vacuum-packaged for *Salmonella* surrogate enumeration. Samples were taken to Food Safety Net Services for enumeration. MacConkey Sorbital Agar was utilized to determine *Salmonella* surrogate survival. The experiment consisted of 3 replications with 2 samples per treatment per replication. Data were analyzed using excel to determine variance and the GLM procedure of SAS (SAS Inst. Inc., Cary, NC) to obtain lsmeans with statistical differences set at $p < 0.05$.

Results

No treatment was more effective at inactivating the *Salmonella* surrogate than another ($p > 0.05$). However, there was a trend ($p = 0.08$) that the temperature 54.4°C was more effective at inactivating the *Salmonella* surrogate than 48.9°C. Strip loins had a 6.2-$\log_{10}$ reduction (var = 0.3) at 54.4°C when held for 2 h and a 6.4-$\log_{10}$ reduction (var = 0.07) when held for 3 h. When held at an internal temperature of 51.7°C a 5.1-log10 reduction (var = 0.59) was achieved when held for 3 h and a 5.5-log10 reduction (var = 0.59) when held for 5 h. Strip loins that were cooked to 48.9°C and held for 10 h resulted in a 4.8-log10 reduction (var = 3.23) and when held for 12 h achieved a 4.9-log10 reduction (var = 1.28). Reduction from brine and rub will be presented on the poster.

Conclusion

Results suggest that lower temperatures may possibly achieve a 6.5 to 7.0-$\log_{10}$ reduction in accordance with Appendix A if the product was held at the temperature for the correct time. This information is useful for companies that wish to use other temperature/time relationships than those stated in Appendix A.

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