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Effect of Pre-Rigor Deboning and Storage Time on the Growth of Salmonella and E. Coli in Various Stages of Beef Sausage Production

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Objectives

Salmonella and *Escherichia coli* are the two most common bacterial pathogens found in ground beef. The objective of this study was to evaluate the effects of pre-rigor deboning and storage time on the growth of *Salmonella* and *E. coli* in various stages of beef sausage production, including grinding, salting, and batter production.

Materials and Methods

Five 24 mo old Holstein steers were slaughtered and the left chuck primals were deboned, ground, and salted (1.5%) within 2 h post-mortem (pre-rigor treatment), whereas the right chuck primals were processed at 72 h post-mortem (post-rigor treatment) without immediate salting. Ground beef was processed into sausage batter on d 7 post-mortem, during which the salting of post-rigor meat was performed separately from batter formulation. At each stage (grinding, salting, and batter production), twelve 25-g samples of lean (GB), salted lean (SB), and batter (BB) were withdrawn for each primal. The samples were inoculated with a cocktail of Nalidixic acid resistant *Salmonella* (*S.* Typhimurium, *S.* Enteritidis, and *S.* Braenderup) and generic *E. coli* in buffered peptone water to achieve a final inoculum concentration of approximately 3 log CFU/g of sample. Inoculated samples were stored at 4°C for 0, 3, 7, and 10 d (a triplicate per time point). Enumeration was performed on XLD (*Salmonella*) and EMB (*E.coli*) agars containing 50 ppm of Nalidixic acid. A randomized complete block design with a split-plot of time and the GLIMMIX procedure of SAS (SAS Institute Inc., Cary, NC) was used to analyze data. Statistical significance was determined at $P \leq 0.05$.

Results

Time of deboning and storage time did not influence *E. coli* counts ($P > 0.284$). *Salmonella* count in the pre-rigor GB was 3.5 log CFU/g, less than that in the post-rigor GB (3.6 log CFU/g; $P = 0.014$), which might be a result of small variability in the current study and might not be practical for the meat industry. Pre-rigor deboning did not affect *Salmonella* counts in SB and BB ($P > 0.965$) and neither did storage time in GB, SB, and BB ($P > 0.089$). *Salmonella* counts were less ($P < 0.001$) in SB (3.2 log CFU/g) and BB (3.1 log CFU/g) than in GB (3.6 log CFU/g).

Conclusion

Results indicated that salting and batter formulation had a greater impact on *Salmonella* counts (0.4- to 0.5-log CFU/g reduction) than rigor state of the raw meat material.