Antimicrobial Interventions for O157:H7 and Non-O157 Shiga Toxin–Producing *Escherichia coli* on Beef Subprimal and Mechanically Tenderized Steaks

Liao, Yen-Te; Brooks, J. Chance; Martin, Jennifer N.; Echeverry, Alejandro; Loneragan, Guy H.; Brashears, Mindy M.

International Center for Food Industry Excellence, Department of Animal and Food Sciences, Texas Tech University, Box 42141, Lubbock, Texas 79409, USA; International Center for Food Industry Excellence, Department of Animal and Food Sciences, Texas Tech University, Box 42141, Lubbock, Texas 79409, USA. mindy.brashears@ttu.edu

**Abstract**

Non-O157 Shiga toxin–producing *Escherichia coli* (STEC) is an emerging risk for food safety. Although numerous post-harvest antimicrobial interventions have been effectively used to control *E. coli* O157:H7 during beef harvesting, research regarding their effectiveness against non-O157 STEC is scarce. The objectives of this study were (i) to evaluate effects of the spray treatments—ambient water, 5% lactic acid (LA), 200 ppm of hypobromous acid (HA), and 200 ppm of peroxyacetic acid (PA)—on the reduction of O157:H7 or non-O157 STEC (O26, O103, O111, and O145) with high (10⁶ log CFU/50 cm²) or low (10² log CFU/50 cm²) levels on beef subprimals after vacuum storage for 14 days and (ii) to evaluate the association of the antimicrobial treatments and cooking (50 or 70°C) on the reduction of the pathogens in blade-tenderized steaks. The treatment effects were only observed (*P* = 0.012) on samples taken immediately after spray intervention treatment following inoculation with a high level of O157:H7. The LA and PA treatments significantly reduced low-inoculated non-O157 STEC after spray intervention; further, the LA and HA treatments resulted in significant reductions of non-O157 STEC on the low-inoculated samples after storage. Although cooking effectively reduced the detection of pathogens in internal steak samples, internalized *E. coli* O157:H7 and non-O157 STEC were able to survive in steaks cooked to a medium degree of doneness (70°C). This study indicated that the reduction on surface populations was not sufficient enough to eliminate the pathogen’s detection following vacuum storage, mechanical tenderization, and cooking. Nevertheless, the findings of this study emphasize the necessity for a multi-hurdle approach and further investigations of factors that may influence thermal tolerance of internalized pathogenic STEC.

*Journal of Food Protection®, Number 3, March 2015, pp. 484-627, pp. 511-517(7)*

*This peer-reviewed journal article was based in part on the following checkoff-funded Project Summary: The Risk and Thermal Susceptibility of Non-O157 and O157:H7 Shiga-Toxin Producing *Escherichia coli* in Non-Intact Beef Products Intended for Foodservice or Retail*