2019 Reciprocal Meat Conference – Undergraduate Research Competition

Meat and Muscle Biology™

Evaluation of the Reduction of *Escherichia coli* O157:H7 Surrogates in Beef Ribeye Rolls at 54.4°C

K. Habib[1], J. Henson[1], K. Tarrant[1], and A. G. McKeith[1]*

[1]Animal Sciences & Agricultural Education, California State University, Fresno, Fresno, CA, USA
*Corresponding author. Email: amckeith@csufresno.edu (A. G. McKeith)

Keywords: appendix A, beef, *E. coli*, ribeye roll
Meat and Muscle Biology 3(2):176

Objectives

E. coli infections are a primary source of gastroenteritis requiring strict cooking and handling procedures for meat producing companies as directed by the USDA. This study evaluated the reduction of *Escherichia coli* O157:H7 surrogates in a low temperature cook process at a local medium-large meat processor. This is one of three microbial validation projects; the other projects will investigate *Clostidium perfrigens* and *Salmonella spp*. The objective of maintaining meat quality (rare color) throughout cooking processes urges the study of low temperature cook processes to determine their efficacy in microbial control.

Materials and Methods

This study was completed in three replications each consisting of a sample size of n = 25. Four strains of *Escherichia coli* (American Type Culture Collection, ATCC® BAA-1427, 1428, 1429, and 1431), each approved as a surrogate for *E. coli* O157:H7, were used in this study. Each surrogate was grown separately. Inoculations of surrogates were prepared utilizing 800 mL of distilled water mixed with 24 g of TSB and inoculated with surrogates. The inoculations were incubated at 37°C for 24 h prior to application. The surrogates were mixed together to make a cocktail just prior to inoculation of meat. Seventy-five (25 per replication) ribeye rolls (IMPS 112-A) were removed from vacuum bags and trimmed. Initial samples were taken to determine initial microbial load prior to inoculation. The pH and temperature were taken in raw meat, after spraying with antimicrobial, and after brining. The pH and temperature of the brine was also recorded. Meat was inoculated with 90 mL of inoculum and was distributed evenly on the surface with a sponge on a stick. The inoculum was allowed to dry for 30 min prior to sampling for inoculation load. Ribeye rolls were then sampled 15 min after going through an antimicrobial spray. Samples for raw meat, initial inoculated meat, and after antimicrobial spray were taken from the surface of the ribeye roll (approximately 100 g). Following sampling, the ribeye rolls were pumped with a brine solution (sugar, salt, and proprietary ingredients) to 15%. The meat was vacuum-packaged in cook-in bags and allowed to sit in a cooler to mimic the longest period of time from packaging until it would be placed in the smokehouse. Ribeye rolls were cooked according to Appendix A at 54.4°C for 112 min, and chilled until the internal temperature was below 4.4°C. Final cooked and chilled samples were taken by cutting a 4 cm steak from the center of the roast. All samples were packaged and sent to Food Safety Net Services (FSNS) for culturing on coliform film. At FSNS 25 g of meat and 225 mL of BPW were stomached, serial dilutions were done and plated on coliform petrifilm and allowed to incubate for 24–48 h. Results were analyzed using the proc GLM procedure of SAS, determining the LSMean and StdError as well as Microsoft Excel.

Results

Initial inoculation loads after inoculation were 6.5 logs and all cooked and chilled samples had less than 1 log. Therefore, the mean log reduction was 5.1 with a standard error of 0.04 from inoculation to post-cook over the three replications.

Conclusion

The results suggest that this cook method is sufficient to reduce *E. coli* O157:H7 in whole-muscle beef ribeye rolls. This information would be beneficial to companies looking to preserve meat quality while utilizing a low temperature cook process.