SALMONELLA SPP. RISK ASSESSMENT FOR COOKING OF BLADE TENDERIZED PRIME RIB

J. W. Wendelburg, D. L. Lambert, C. L. Kastner, R. K. Phebus, H. Thippareddi, and J. L. Marsden

Summary

Prime rib is generally prepared by cooking to low temperatures for long times to attain the desired tenderness and juiciness. Destruction of *Salmonella* spp. in blade tenderized prime rib was examined by following cooking procedures commonly used by chefs. Beef ribs (boneless) were inoculated with *Salmonella* spp. to attain initial surface levels of about 5.75 $\log_{10}$ CFU/cm^2. The ribs were blade tenderized (one pass) using a Ross blade tenderizer. Each was split into two equal sections. One half was cooked to a target internal temperature of 110 and the other half to 120°F, then tempered at room temperature for up to 60 min and placed in a holding oven (120°F) for up to 120 min. Reductions of 4.54 and 4.80 $\log_{10}$ CFU/g were attained for roasts removed from the oven at 110 and 120°F, respectively. Even though prime rib preparation utilizes very low cooked product temperatures, the long cooking time and tempering period result in substantial process lethality and a safe final product.

(Key Words: Blade Tenderization, *Salmonella*, Prime Rib Cookery.)

Introduction

The meat industry must provide product quality and uniformity, especially with regard to tenderness. Blade tenderization is an effective method of meat tenderization. However, this process can translocate surface bacteria into the muscle. This research was done to determine the effectiveness of cooking/holding protocols on reducing *Salmonella* spp. populations that may contaminate the interior of prime rib as a result of translocation due to blade tenderization.

Experimental Procedures

Fifteen boneless beef ribs (roast ready, NAMP 110) were surface-inoculated (fat side) to a target contamination level of 10^7 *Salmonella* spp./cm^2. A five strain cocktail of *Salmonella* spp., used in all investigations, was applied by a light mist of the inoculum onto the exterior meat surfaces. After 30 min, one set of ribs was blade tenderized (Ross C700M, Midland, VA, fat side up) using one pass, with the unit's conveyor moving 1.25 inches forward and 0.5 inches laterally between each blade cycle. The 448 blades of the tenderizer produce 32 incisions per square inch. Product was held at 40°F until cooking (about 1 h). A Type T thermocouple was inserted into the geometric center of each roast through the side and roasts were cooked in a conventional kitchen oven at 375°F to a specific end-point temperature of either 110 or 120°F. Upon reaching the end-point temperature, the product was removed from the oven and tempered at room temperature for 0, 30 or 60 min, then held at 120°F for 0, 60 or 120 min.

Microbiological samples were obtained after blade tenderization, again immediately after

removal from the oven or after 60 min of tempering, and a third sample after 60 or 120 min of holding at 120°F subsequent to the 60 min tempering. A 1.0 × 1.0 × 1.0-inch section was excised (parallel to the blade channels), from the geometric center of the roast for each treatment. The samples were placed in plastic bags and immersed in an ice water bath to bring the meat temperature down quickly. These samples were microbiologically analyzed for *Salmonella* spp.

Surviving *Salmonella* spp. populations were counted by direct plating on Xylose Lysine De-oxycholate Agar (XLD) and modified Xylose Lysine De-oxycholate Agar (mXLD).

Bacterial population reduction was based on a comparison to inoculated but uncooked control roasts receiving the same processing treatment. If a specific cooking time/temperature reduced the inoculated *Salmonella* spp. to below the detection level of direct plating, stored samples were enriched according to modified USDA protocols. Four replications of the experiment were performed with duplicate roasts being cooked and analyzed for each cooking treatment within replications.

Results and Discussion

Cooking prime ribs to 110 and 120°F internally with subsequent holding at 120°F for 1 h reduced *Salmonella* spp. by 4.54 and 4.80 $\log_{10}$ CFU/g, respectively, from initial levels of 5.76 $\log_{10}$ CFU/g. Internal temperatures reached during cooking were not expected to result in a high level of destruction of *Salmonella* spp., but microbial cells on the surface of the prime rib would be exposed to higher, lethal temperatures.

Combined tempering and holding at 120°F (Table 1) showed the most reduction with 60 min tempering followed by 120 min holding and resulted in a safe final product.

Table 1. *Salmonella* spp. Reductions Attained by Cooking Prime Rib to Internal Temperatures of 110 or 120°F (Pooled Data), Tempering (T) at Ambient Temperature and Holding (H) for Various Periods at 120°F

Tempering (min) at Room Temperature	Holding (min) at 120°F	Reduction Log_{10} CFU/g
0	0	3.87
30	0	5.02
60	0	4.47
60	60	4.72
60	120	5.29