

**Characterization of *E. coli* 0157:H7 on Subprimal  
Beef Cuts Prior to Mechanical Tenderization  
Project Summary**

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# **Characterization of *E. coli* O157:H7 on Subprimal Beef Cuts Prior to Mechanical Tenderization**

## **Project Summary**

### **Background**

Highly publicized outbreaks of food-borne illness since 1993, primarily caused by bacteria such as *E. coli* O157:H7, *Salmonella spp.* and *Listeria monocytogenes*, elicited intense consumer concern about meat safety. In response, regulatory authorities, researchers and the beef industry initiated efforts to implement food safety management systems that would improve microbiological quality. The USDA Food Safety and Inspection Service (FSIS) began initiating new regulatory requirements during the mid-1990s. Packers were required to knife-trim carcasses to remove all visible contaminants, comply with written sanitation standard operating procedures (SSOP), implement Hazard Analysis Critical Control Point (HACCP) systems, and meet microbiological performance criteria and standards for *E. coli* and *Salmonella* as a means to verify HACCP effectiveness and pathogen reduction.

Researchers and beef packers/processors have addressed consumer food safety concerns by developing a variety of methods that are now implemented, or are being further developed, to reduce numbers of bacteria on beef and beef products and improve microbiological safety. These microbiological decontamination technologies include:

- Animal cleaning;
- Chemical dehairing at slaughter;
- Spot-cleaning of carcasses by knife-trimming or steam/hot water vacuuming; and
- Spraying/washing/rinsing of carcasses before evisceration and/or before chilling, with water, chemical solutions and/or steam or hot water.

In January 1999, the Food Safety and Inspection Service of the United States Department of Agriculture (FSIS-USDA) announced the intention to expand the *Escherichia coli* O157:H7 adulteration policy to include non-intact products. Concerns related to *E. coli* O157:H7 and blade/needle tenderized, injected/enhanced and restructured beef focus on the possibility that organisms on the surface of the product could be introduced into the deep muscle tissue, thus becoming more likely to survive unless the beef is cooked to a higher internal temperature. The main objective of this study was to determine the extent to which *E. coli* O157:H7 is present on the surface of subprimal cuts prior to mechanical tenderization in beef processing plants across the U.S.

### **Methodology**

A total of 1,014 samples were collected from six (6) beef processing plants across the U.S., including three (3) steak cutting and three (3) packing facilities, for five-weeks during the months of June and July. Each week, samples were collected from a 200 cm<sup>2</sup> surface of subprimal cuts just prior to mechanical tenderization using sponges pre-

moistened with buffered peptone water (BPW) and 10 cm x 10 cm sampling templates. Samples were sent in a shipping cooler with frozen gel packs via overnight courier to Food Safety Net Services, Ltd. in San Antonio, TX for evaluation and enumeration of *E. coli* O157:H7.

### **Findings**

Of the 1,014 samples evaluated over the five-week test period, 2 (0.2%) of the samples screened positive for *E. coli* O157:H7. Enumeration of the 2 positive samples using a most probable number (MPN) from serial dilutions of the original samples revealed that each sample had <0.375 colony-forming units (CFU) per cm<sup>2</sup> of the subprimal sampled.

The results of this evaluation reveal the low incidence of *E. coli* O157:H7 on the subprimal beef cuts sampled. Further, for those samples that were positive for *E. coli* O157:H7, the organism was detected at a level of <0.375 CFU per cm<sup>2</sup>. Taken together these data indicate that *E. coli* O157:H7 is not commonly found on the surface of subprimal beef cuts prior to mechanical tenderization. The study provides strong evidence that internal contamination of subprimal beef cuts by *E. coli* O157:H7 via mechanical tenderization is unlikely to occur.

### **Implications**

The Centers for Disease Control (CDC) estimates that there are 76 million cases of food-borne illness in the United States annually, with 14 million cases attributed to known pathogens. *E. coli* alone is estimated to account for 76,000 cases of food-borne illness and 76 deaths annually. Multiple intervention strategies to inhibit or eliminate *E. coli* in the beef production process are extremely important to the industry. The results of this study indicate that the incidence of *E. coli* O157:H7 on subprimals is low and provide strong evidence that internal contamination due to mechanical tenderization is unlikely to occur.