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STANDARDIZED MICROBIAL SAMPLING AND TESTING PROCEDURES FOR THE BEEF INDUSTRY

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BACKGROUND

Intense interest in the microbiological profile of beef carcasses led USDA's Food Safety and Inspection Service to conduct the Nationwide Beef Microbiological Baseline Data Collection Program for Steers and Heifers from October 1992 through September 1993 (USDA-FSIS, 1994). The program was conducted to establish the levels of potentially pathogenic bacteria on beef carcasses processed under standard practices during that time period. Since that time, some practices have been, and will be, initiated that may impact the microbiological quality of carcasses and products from those carcasses. For example, more extensive trimming on the slaughter floor has been mandated and is being evaluated for efficacy. Additionally, new and revisited intervention treatments such as organic acids sprays and trisodium phosphate may impact the microbiological profile of carcasses and resultant cuts. Also, intensified HACCP training and program implementation will have an impact on future microbial profiles of carcasses and their products. Therefore, it is desirable to track the microbiological condition of beef as a continuum rather than just stopping with discrete point-in-time evaluation.

OBJECTIVE

The objective of this study was to develop standardized microbiological sampling and testing procedures that can be used throughout the beef slaughter and processing industry.

METHODS

Samples of carcasses, subprimal cuts, lean trim, and cutting/conveyor surfaces were taken to represent possible areas of contamination during slaughter and fabrication. For the carcass sample, the brisket, flank and rump areas were sampled. These were the same areas used for the FSIS Baseline study. The subprimal cut sampled was the clod, and lean trim was collected from conveyor belts in the fabrication area. Surface sample swabs were taken from a working surface or a moving conveyor belt in the fabrication area.

A stainless steel metal template with 20x15 cm area (300 cm^2) was used to mark carcass and clod sample areas. For cutting surface samples, a 15x10 cm area was sampled. Before sampling, all templates, knives and forceps were sterilized by spraying the equipment with 95% ethanol and flaming over a sterno burner. The following procedures were used for collecting samples:

Carcass Sample

Carcass sides were selected randomly 24-72 hours after slaughter. The first sample collected was the brisket sample. First, the elbow was located, then an imaginary line was drawn medially to the midline (USDA-FSIS, 1993a). This was the starting point. The 300 cm^2 template was placed in this area to excise a sample that was 20 cm vertically by 15 cm laterally and 1 cm thick.

The flank was collected second by locating the cutaneous flank muscle (external abdominal oblique), then following the medial border of the muscle anteriorly until it came within approximately 8 cm of the midline (USDA-FSIS, 1993a). This was the starting point. A 300 cm^2 template was used to excise a sample that was 20 cm posteriorly by 15 cm laterally and approximately 1 cm thick.

The rump sample was collected last by locating the posterior aspect of the aitch bone and drawing an imaginary line toward the achilles tendon. The starting point was where the line intersected the cut surface of the round (USDA-FSIS, 1993a). A template was then placed in this area to excise a sample that was 20 cm vertically by 15 cm laterally and 1 cm thick.

Subprimal Sample

During fabrication of previously sampled carcasses, clod samples were randomly collected during the shift. To collect the sample, a 300 cm^2 metal template was placed in the center of the outside surface of the clod.

Cutting/Conveyor Surface Sample

Surface swab samples (15x10 cm) were taken from either the cutting tables or conveyors belts where fabrication of the clod occurred. Samples were taken randomly throughout the shift and at time 0. Cary and Blair medium (DIFCO, Detroit, MI) was used to collect and transport the samples.

Lean Trim Sample

Approximately five (5) lbs of lean trim was collected from the fabrication area and coarse ground (1.27 cm plate) through a small lab size grinder. The first ½ pound was discarded. A random one lb sample was taken from the remaining five (5) lbs of ground beef.

Sample Shipment

All samples were placed in insulated containers with gel packs capable of maintaining refrigeration temperatures (not frozen). The samples were shipped overnight to a microbiological laboratory for analysis.

Microbiological Analysis

All samples were tested for the same microorganisms as those specified in the FSIS Baseline study (USDA-FSIS, 1993b). All samples were examined quantitatively for numbers of *Staphylococcus aureus* (coagulase positive staphylococci), *Clostridium perfrigens*, *Escherichia coli* biotype I, total coliforms and aerobic mesophilic bacteria; whereas the same samples were qualitatively analyzed for *Listeria monocytogenes*, *Salmonella*, *E. coli* O157:H7, and *Campylobacter jejuni/coli*. In addition, any sample found to contain *Listeria monocytogenes*, *Salmonella*, *E. coli* O157:H7 or *C. jejuni/coli* was quantitatively analyzed for the same organism using the enumeration procedures outlined in the FSIS program (USDA-FSIS, 1993b).

RESULTS AND DISCUSSION

Sample collection was conducted in small and large slaughter and processing operations. The outlined procedures were effective in allowing samples to be collected in the same manner for both operations. From a logistical standpoint, approximately 20 samples of carcasses, clods, lean trim and surface swabs were able to be taken within 5-6 hrs by five people. Collection of the samples did not interfere with or slow down daily production process.

A final GMP document will be published. The document will contain detailed explanations and graphics of the sampling procedures, plus an appendix of the microbiological analysis methods. The document will be distributed to beef slaughter operations in the U.S.

CONCLUSIONS

Standardized microbial sampling and testing procedures will be beneficial for the beef industry in developing industry data that can be compiled and effectively address microbial trends due to season, location, intervention strategies, FSIS policies, and/or company policies and size of operation.

ACKNOWLEDGMENTS

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PERTINENT LITERATURE

USDA-FSIS. 1993a. Nationwide Beef Microbiological Baseline Data Collection Program. Carcass Selection and Sample Collection Procedures. Food Safety and Inspection Service. Washington, DC.

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