Project Title: Examination of the Impact of Pre-harvest Events and Practices on *Salmonella* Contamination of Peripheral Lymph Nodes

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Background

The foodborne pathogen *Salmonella* has been detected in peripheral lymph nodes (PLN) of cattle at harvest. Fat trim containing lymph nodes may be a component of ground beef and has been identified as a source of *Salmonella* in this commodity. Lymph node harborage of *Salmonella* poses a challenge for in-plant antimicrobial interventions in that internalized *Salmonella* are protected from the usual carcass decontamination technologies currently used in packing plants. Managing the food safety risk associated with *Salmonella* creates a significant cost to the beef harvest operation and *Salmonella* infection of cattle can have a negative impact on cattle performance in the production operation. As a result, investigating ways to mitigate the risk of *Salmonella* contained within the lymph nodes of cattle in the production environment was needed.

The mechanism of entry of *Salmonella* into bovine PLN has yet to be determined. One hypothesis states that *Salmonella* present on cattle hides may be introduced transdermally, via biting insects or cuts in the hide. A second hypothesis assumes that bovine salmonellosis infection (enteritis resulting in fever and diarrhea) may result in dissemination of *Salmonella* to sites outside the GI tract, such as the peripheral lymphatic system. While bovine infection studies could be used to examine the validity of the second hypothesis proposed above, the results obtained may not be an accurate reflection of reality because the serotypes and levels of *Salmonella* used to induce infection in an artificial setting may result in a more aggressive infection than that encountered in a natural feedlot setting. Ideally, examining the effect of salmonellosis infection on PLN *Salmonella* contamination would involve identifying a cohort of cattle that had experienced a salmonellosis outbreak, and then characterizing *Salmonella* levels in the cohort environment as well as PLN contamination at harvest.

The objective of this study was to follow cattle that had experienced a salmonellosis outbreak from the feedlot through harvest and determine if salmonellosis resolved through antimicrobial therapy results in colonization of bovine peripheral lymph nodes.

Methodology

This study was conducted at a commercial feedlot facility where a salmonellosis outbreak had occurred among several pens of cattle. Sampling focused on pens considered as either high or low involvement in the outbreak (three each). Outbreak data and treatment histories were obtained. Cattle fecal and hide swabs, and feed and pen surface material samples were collected over the course of the study. Fecal swab samples were collected from animals known to have been infected and treated and uninfected cohorts as control animals.

All samples were analyzed for the concentration and prevalence of *Salmonella*. Samples of pen surface material (4 samples/pen) were collected from six feedlot pens. Cattle (n=125) were sampled upon exit from temporary holding pens following treatment. Individual feed component samples were collected. In addition, fecal swab samples were collected following

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the final sort from 30 head in 6 pens. Peripheral lymph nodes (6 per carcass) were collected from carcasses at the processing plant to evaluate the effects of infection and treatment on *Salmonella* load at the time of cattle harvest.

Findings

Hide and fecal samples were collected from cattle segregated from the rest of the herd in temporary holding pens following antimicrobial treatment for salmonellosis. Fecal prevalence of *Salmonella* was 2.4%, while hide prevalence was 44.0%. All pen surface material samples collected from 6 feedlot pens and 1 temporary holding pen were positive for *Salmonella*. One feed sample (silage) harbored *Salmonella*. Sampling cattle at re-implant showed that fecal prevalence of *Salmonella* remained steady (3.3%), while hide prevalence of *Salmonella* had decreased to 6.1%. At harvest, only one lymph node out of 227 (0.4%) analyzed was positive.

Serotyping of *Salmonella* isolates from diagnostic samples collected from infected cattle at the time of the outbreak yielded Montevideo and Newport serotypes. Only the Newport isolates were associated with clinical pathology. The Montevideo strains did not produce any discernable tissue necrosis in the infected cattle. Serotyping *Salmonella* isolates from the pen surface material showed that all samples harbored Montevideo isolates. Two samples from each of two pens also harbored Newport isolates.

The PFGE patterns for the Newport isolates from the pen surface material samples were indistinguishable from the PFGE patterns for the Newport strains isolated from the clinical diagnostic samples (Figure 1). Based on the widespread distribution of Montevideo isolates from the pen surface material and cattle hides, it was concluded that *Salmonella* Montevideo was likely endemic to this cattle herd and *Salmonella* Newport was considered the outbreak strain. *Salmonella* Newport was isolated from a feed sample (silage) and was similar to the PFGE pattern of the Newport isolates from the diagnostic and pen surface samples, but not identical. The only *Salmonella* isolate obtained from lymph node sampling was an Anatum serotype.

Implications

These data suggest that salmonellosis outbreaks in cattle do not result in inherent long-term carriage of the outbreak strain. Prior to this study, it was unknown if bovine peripheral lymph nodes from cattle that had salmonellosis infections would be persistently infected leading to an increased food safety risk at harvest. As only one lymph node of the 227 tested was found to harbor *Salmonella,* and it was not the outbreak strain, these data indicate that bovine salmonellosis does not result in persistent *Salmonella* PLN contamination.

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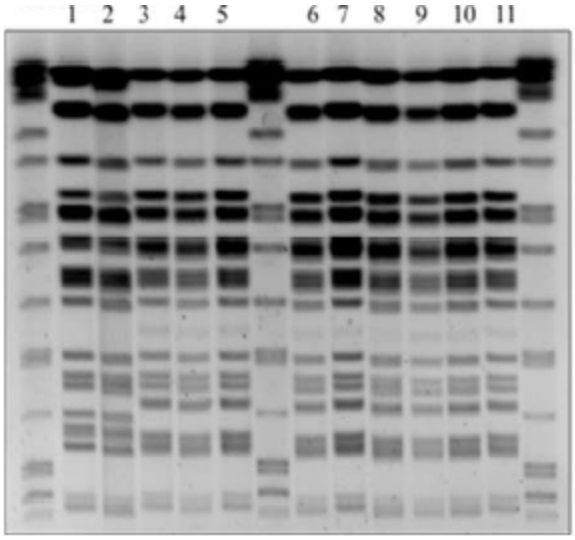

Lanes
1-2 Silage
3-10 Pen surface material
11 Diagnostic sample

Figure 1. PFGE image for *Salmonella* Newport isolates

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