BEEF INDUSTRY SAFETY SUMMIT
March 4-6, 2014
Dallas, TX

Project Title: Integrating Routine Testing, Molecular Subtyping, and Mitigation Strategies to Counter *Listeria monocytogenes* Persistence in the Meat Processing Plant Environment

Presenter: **Alex Brandt,** Eva Borjas, Jessica Chen, Martin Wiedmann, and Kendra Nightingale
Email: alex.brandt@ttu.edu
Mailing Address: Box 42141, Lubbock, TX 79409

Category: Post-Harvest Pathogen Reduction

Published: Unpublished to Date

Objective:

This study tracked *Listeria monocytogenes* contamination patterns for six months in two custom-exempt meat processing facilities. Employee trainings, suggested mitigation strategies, and behavioral assessments were provided after the initial six month sampling period. Follow-up sampling was subsequently conducted to assess the impact of these strategies.

Experimental Treatments:

Sponge samples were collected monthly for six months from food contact surfaces, non-food contact surfaces, and finished products in two custom-exempt meat processing facilities. Samples were processed according to the USDA-MLG protocol 8.07 with modifications. *Eco*RI ribotyping was performed to obtain molecular subtypes for *L. monocytogenes* isolates. Following the initial sampling period, in-plant employee trainings were provided which covered pathogen ecology, transmission, and persistence, along with facility-specific testing results and suggested mitigation strategies. Employee knowledge changes were determined via paired t-test analysis of pre- and post-training scores for a 28-question written assessment. Pre- and post-training responses to an employee self-reported behavioral assessment were analyzed via Fisher's exact test. Implementation of suggested facility physical changes was recorded in manager questionnaires. Follow-up samples were collected on two occasions using testing methodology and subtyping identical to that employed during the initial six-month period.

Key Results:

Statistical analyses identified persistent *L. monocytogenes* strains in Facility 1 (DUP-1042B) and Facility 2 (DUP-1062B, DUP-1062E, and DUP-1053E). Means scores for the employee knowledge assessments increased for both facilities post-training; the increase in knowledge for Facility 2 was significant (P=0.05). Facility 1 implemented physical facility improvements immediately post-training, and significant behavior changes were reported regarding facility-designated footwear (P=0.005) and footwear sanitation (P=0.005). Follow-up sampling demonstrated that *Listeria* prevalence decreased significantly (P=0.001) although ribotype DUP-1042B continued

to persist. Facility 2 did not immediately implement physical improvements; a decreased prevalence of *Listeria* was not observed (P=0.188) and ribotype DUP-1062B persisted during follow-up. A significant change in hairnet use (P<0.001) was reported, and the facility's lowest point prevalence (11.8%) followed implementation of physical improvements in the interim time between follow-up samplings 1 and 2.

How can this information can be applied in the industry?

Multi-state outbreaks of listeriosis have been associated with persistence of *L. monocytogenes* in the meat processing plant environment. Studies which employ combined testing and molecular subtyping to define persistence and identify mitigation measures (including employee trainings, behavioral changes, and physical facility improvements) are limited. This study demonstrates that a multi-pronged approach integrating this array of strategies may aid in mitigation of *L. monocytogenes* persistence in meat processing plants and minimize its entry into the food chain. However, outcomes may vary by facility and persistent subtypes may be able to withstand stringent control measures that are implemented.

Figures:

FIG 1: Longitudinal Prevalence of *Listeria* Species Among Sites that Tested Positive At Least Once During an Initial Six-Month Sampling Period in Two Custom-Exempt Meat Processing Facilities.
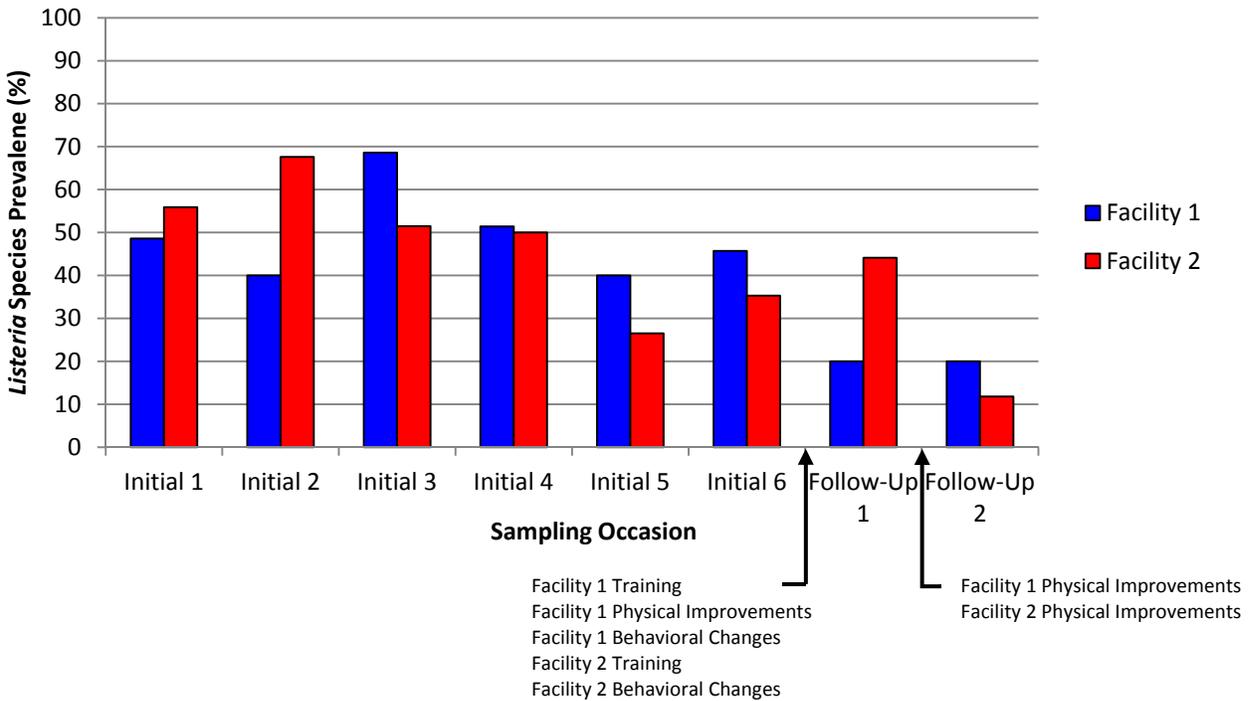
FIG 2: Pre- and Post- Employee Training Knowledge Assessment Score Means for Two Custom-Exempt Meat Processing Facilities.

Pre-Training

Post-Training

* The increase for Facility 2 was significant (P=0.05).