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Changes in Presence of Shiga Toxin-Producing Escherichia Coli (Stec) and Salmonella Spp. in Very Small Honduran Beef Processing Plants after Personnel Training in Food Safety Practices

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Objectives

To evaluate reduction of STEC and *Salmonella* in 2 small beef processing plants in Honduras after training and implementation of SSOP and GMP.

Materials and Methods

Changes in pathogen presence were monitored in 2 small Honduran beef processing plants. Plants processed 140 and 25 heads of cattle per week. Initially, neither plant had food safety programs in place. Swab samples of plant A ($n = 160$) and plant B ($n = 78$) were taken from direct and indirect food contact surfaces on January, May, June and July for plant A and January, March, June, and July for plant B. After each sampling month, SSOP for equipment and surfaces with positive pathogen presence were provided to the plants. Additionally, employees underwent comprehensive SSOP, GMP and HACCP training. Swab samples were analyzed by BAX RT *Salmonella* and STEC screening and confirmed using immunomagnetic separation, selective media and latex agglutination. Fisher's exact tests for equality of proportions were used in R (v3.4.4) statistical package to compare pathogen presence among sampling months.

Results

In Plant A, STEC occurred in 10, 12.5, 0, and 5% of the environmental samples respective to each month, indicating a significant reduction of STEC ($p < 0.10$) by the third sampling month. This coincided with the completion of GMP, SSOP and HACCP training, providing customized GMP manuals, and the use of SSOP for disinfection of targeted equipment, surfaces, and utensils found with

positive pathogen presence in previous sampling dates. In plant A, after implementation of SSOPs for targeted positive sampling areas, samples were not positive in subsequent sampling months, indicating effectiveness of recommended SSOPs. In Plant A, *Salmonella* environmental presence was at 0% except at one sampling interval and thus was not adequate to validate effective implementation of interventions. *Salmonella* environmental presence for each month in Plant B was of 5.6, 6.3, 27.3, and 0.0%, respectively. In plant B, persistence of *Salmonella* was observed in the stuffer, where confirmed *Salmonella* isolates were found in January and March. After second positive sample was found, in-plant training of stuffer SSOP was made, resulting in absence of *Salmonella* in the stuffer in June. The highest *Salmonella* presence was observed by the fourth sampling month. Therefore, additional actions were taken to reinforce implementation of SSOP and GMP manual instructions, and verification procedures, which collectively resulted in a *Salmonella* reduction to 0% ($p < 0.10$) by the fourth sampling month. STEC presence in this plant was too low to be an indication of validation of the effectiveness of implementation of interventions.

Conclusion

These experiences demonstrate the feasibility of fully implementing SSOP with verification procedures and compliance with the instructions of a customized GMP manual. Trained employees are more involved in cleaning and disinfection procedures before and after processing. In addition, evisceration and other dressing procedures are performed with more caution. In summary, the ongoing training of plant personnel increases awareness of food safety. Consequently, the presence of STEC and *Salmonella* can be significantly reduced in this type of facility.