**Title** Epidemiology of Salmonella and *E. coli* O157 in beef cattle production systems

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**Abstract**

*Salmonella* and *Escherichia coli* O157 are important causes of foodborne illness in humans and have been associated with the consumption of undercooked, contaminated beef. Individual feedlot cattle may shed these organisms in their feces and subsequently contaminate cattle hides and carcasses at harvest. Preharvest and harvest interventions may significantly decrease the risk of beef contamination and subsequent risk of human illness. Previous research suggests that preharvest interventions for *Salmonella* or *E. coli* O157 may compliment harvest interventions and reduce the risk of carcass contamination. In my research, I used diverse study designs to develop a better understanding of the epidemiology of *Salmonella* and *E. coli* O157 and evaluate the impact of specific preharvest interventions in commercial feedlot cattle. A randomized controlled trial indicated that a commercially available vaccine did not affect the fecal prevalence of *Salmonella,* or health and performance of cohorts of feedlot cattle. However, the fecal prevalence of *Salmonella* varied by cohort, suggesting cattle source as a risk factor. In a repeated cross-sectional study, the fecal prevalence of *Salmonella* in cattle at feedlot arrival was not associated with the prevalence immediately prior to harvest, yet specific *Salmonella* subtypes, as defined by pulsed-field gel electrophoresis (PFGE), persisted throughout the feeding period. Another of my studies defined and compared PFGE subtypes of *E. coli* O157 isolated from cattle feces and carcass samples at harvest to determine relationships between fecal shedding and carcass contamination. Truckload appeared to be an important factor, and feces from cattle shedding both high- and low-concentrations of *E. coli* O157 posed a risk for carcass contamination. A stochastic Monte-Carlo modeling framework was later used to assess the impact of seasonal fecal prevalence and combinations of preharvest interventions on the risk of carcass contamination with *E. coli* O157. Results indicated that it may be important to incorporate multiple preharvest interventions, especially during periods of high fecal prevalence of *E. coli* O157. Overall, the research described in this dissertation demonstrates that multiple risk factors and interventions at the cohort level must be considered in order to mitigate the risks associated with *Salmonella* and *E. coli* O157 in beef production systems.