

Title Preharvest *Escherichia coli* O157:H7 vaccination of beef cattle: Industry-wide acceptance through a beef production lifecycle approach

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Abstract

Escherichia coli O157:H7 is responsible for over 70,000 cases of human illness every year in the United States. Most cases occur in children under the age of five, the elderly, or other immune-compromised people. A small percentage of these cases will develop a life threatening complication, hemolytic uremic syndrome. Cattle are the reservoir host for *E. coli* O157:H7 and serve as the main source of contamination of meat products and other food sources. The beef cattle industry is diverse with producers caring for as few as one to as many as thousands of cattle. The first objective of this research was to examine three major production systems (conventional, organic, and natural) in the U.S. and the published performance effects of the various technologies used in each system. The second objective was to determine if a newly licensed *E. coli* O157:H7 SRP[®] (SRP) vaccine administered to cows pre-partum could achieve successful passive transfer in their offspring. The third objective was to determine if colostrum obtained from SRP vaccinated heifers could protect against an oral challenge with an *E. coli* K99⁺ strain. The fourth objective was to examine the shedding characteristics, health, and performance effects of calves born to SRP-vaccinated cows that also receive SRP vaccination themselves. The technologies used in conventional beef cattle production resulted in significant improvements in health and performance of beef cattle. Vaccinating cows pre-partum with SRP resulted in passive transfer in calves consuming their colostrum. Calves that achieved successful passive transfer shed less *E. coli* K99⁺ and had improved fecal consistency compared to placebo. When calves were vaccinated with SRP at branding, weaning, and arrival to the feedyard there was no difference in fecal *E. coli* O157:H7 shedding on arrival to the feedyard or at harvest. Vaccinating calves with SRP had no effects on performance or health outcomes. Vaccinating cattle with SRP may provide protection against other pathogenic *E. coli*

strains and warrants further investigation. The timing of vaccination appears to be an important consideration in order to ensure maximum vaccine efficacy.