

Characterization of Specific Passive Immunity Stimulated by Vaccination of Beef Cows Grazing Native Range with *E. coli* O157:H7-SRP®

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Introduction

Escherichia coli O157:H7 is a contaminant of beef products and has been associated with food-borne illnesses in humans. Recently an *E. coli* SRP® vaccine received conditional licensure in the United States for the control of *E. coli* O157 in cattle. *E. coli* is also a common disease agent responsible for causing postnatal calf diarrhea. Colostrum management is recognized as an important factor for calf health and survival. Calves that fail to consume an adequate amount of colostrum within the first 12-24 hours after birth are at a higher risk for disease, death, and decreased performance. The objective of this study was to determine if *E. coli* O157:H7 SRP®-specific antibodies could be detected in the serum of calves that consumed colostrum from dams that were vaccinated prior to calving with *E. coli* O157:H7 SRP® vaccine.

Materials and Methods

In January of 2009, 20 cows were utilized from the Kansas State University cow-calf unit herd to study the efficacy of passive transfer of *E. coli* O157:H7 SRP® antibodies in beef calves. A group of four-year-old cows were selected from the herd, based on predicted calving dates to control for parity, and were balanced across pastures. The cows were randomly assigned to either a vaccine treatment or placebo vaccine treatment group. The vaccine was prepared by the sponsoring company and labeled as A and B to blind the study director as to treatment. Cows were vaccinated with their assigned treatments at 60 and 30 days prior to the projected start of the calving season. Blood samples were taken from cows prior to the initial vaccination to ensure *E. coli* O157:H7 SRP® antibody-free status. Serum ELISAs for detection of *E. coli* O157:H7 SRP® antibodies were conducted by Epitopix, LLC. All laboratory personnel were blinded to treatment assignment. At the time of calving, fecal, blood, and colostrum samples were ob-

tained from the cow and a pre-suckle blood sample was obtained from the calf. Blood samples were then obtained from the calves at six, 12, and 24 hours and at seven, 14, and 21 days postpartum. Serum total protein and *E. coli* O157:H7 SRP® antibody levels were measured. Data were then analyzed using the wsnova procedure in STATA® for repeated measures within an individual.

Results

Vaccination treatment that cows received had no effect on the calf serum total protein (TP) level ($P>0.05$). However, the length of time post-birth had a significant effect on the calf serum TP levels ($P<0.001$). This is an expected finding, given that calves are born agammaglobulinemic until absorption of maternal antibodies from colostrum. One calf on the study was classified as having failure of passive transfer (TP level $<5.5\text{g/dL}$). There was a vaccine treatment by time post-birth interaction observed for the calf serum *E. coli* O157:H7 SRP® antibody levels ($P<0.01$). This interaction was explained by no vaccine treatment difference in calf serum *E. coli* O157:H7 SRP antibody levels pre-suckle, but a significant increase in calf *E. coli* O157:H7 SRP post-suckle titers in the calves born to SRP®-vaccinated cows, compared to calves born to cows that received a placebo control. All 20 cows were negative for fecal shedding of *E. coli* O157:H7 throughout the study.

Significance

This is the first report of successful *E. coli* O157:H7 SRP® antibody passive transfer in beef calves under natural range conditions. This now lays the ground work for further study into possible cross protection of this vaccine against neonatal *E. coli* diarrhea strains such as K99. This also is the first step of an ongoing study examining early immunization against *E. coli* O157:H7 and its effects on shedding of the organism by the animal at the point of harvest.