

Protection of Calves Against Cryptosporidiosis with Immune Bovine Colostrum

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Introduction

Cryptosporidium parvum is a major cause of infectious diarrhea in newborn calves, with an estimated economic cost of \$49 million annually to the cattle industry. Uncontrolled cryptosporidiosis in livestock leads to contamination of the environment with infectious oocysts, possibly leading to outbreaks of human disease. Ineffective treatment modalities and disinfection procedures mandate the need for preventative vaccines. We have identified, cloned and sequenced a geographically conserved *C. parvum* antigen, C7, which we believe to be an ideal candidate for a preventative vaccine.

Materials and Methods

To determine the protective capacity of this antigen, recombinant C7 (rC7) was administered subcutaneously to late-gestation Holstein cows 3 times over a 6-week period. Non-vaccinated cows were utilized as negative controls. First-milking colostrum was collected from each group of cows, pooled and frozen. Pooled colostrum from immunized cows reacted with rC7 in Enzyme-Linked Immunosorbent Assay (ELISA) at a titer

of >1:100,000 whereas the titer from non-immunized cows was <1:100. Twelve newborn Holstein bull calves were obtained at birth and assigned to receive colostrum either from immunized cows or non-immunized cows by blind code. Calves were fed 3 liters of colostrum within 2 hours of birth, 2 liters at 12 hours of age and 1 liter at 24 hours of age. Each calf was challenged with 10^7 *C. parvum* oocysts at 12 hours of age.

Results and Conclusion

All 6 calves receiving non-immune colostrum developed severe diarrhea (mean total fecal volume = 8447 ± 5600 ml) and shed an average of $1.87 \pm 1.66 \times 10^{12}$ *C. parvum* oocysts. In contrast, none of the 6 calves receiving colostrum from immunized cows developed diarrhea (mean total fecal volume = 740 ± 750 ml, $p < 0.05$) and shed significantly fewer oocysts ($3.05 \pm 2.26 \times 10^9$, $p < 0.05$). The absence of diarrhea and significant reduction in fecal oocyst shedding observed in calves receiving immune colostrum suggests rC7 is an ideal *C. parvum* vaccine antigen that will provide substantial passive protection to newborn calves.