The effect of anti-Il-10 IgY on health and performance of preweaned dairy calves: a dose response study

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Introduction

Cryptosporidium parvum infection is a nearly ubiquitous infection in dairy herds for which there are no approved treatments or vaccines available in the US. Therefore, oral administration of immunoglobulins to control enteric disease in calves is of significant interest. Antibodies survive gastrointestinal transit, are accessible in the intestinal lumen, and remain locally active without the risk of violative residues. Our research team previously demonstrated that calves fed anti-Il-10 IgY in milk had higher fecal pH, reduced respiratory disease, and increased frame measurements. Therefore, the objective of the current study was to carry out a dose-response trial evaluating the effects of feeding 0.5x, 2.0x, and 1x the dose from the original study on respiratory and gastrointestinal health, *C. parvum* oocyst shedding, and calf growth.

Materials and Methods

This randomized clinical trial was carried out on at a single calf ranch in southern Wisconsin from June through Sept 2015. Calves were fed pasteurized whole milk to which a daily dose of whole pasteurized egg powder was divided amongst 3 daily milk feedings for the first 14 days after arrival. Two hundred forty-one calves enrolled between 24 and 72 hours of age received whole egg powder. Group 1 (n=60) received 1.2 gm egg powder without IL-10 antibodies (placebo), while Group 2 (n=61) received 0.6 gm egg powder with IL-10 antibodies, Group 3 (n=60) received 1.2 gm egg powder with IL-10 antibodies, and Group 4 (n=60) received 2.4 gm egg powder with IL-10 antibodies, daily. Twice weekly health evaluations and fecal scores were made for 56 days. A subset of calves was randomly assigned to weekly thoracic ultrasound examinations. Calves with clinical signs of respiratory disease had thoracic ultrasound examination at first diagnosis. Digital weights and hipometer measurements were determined at enrollment and day 56. *C. parvum* shedding was assessed on day 14. "Diarrhea days" was the number of days with fecal score greater than 1. "BRD days" was the number of days that a calf had a score of 2 or greater for at least 2 specific parameters (temperature, ear position, ocular discharge, nasal discharge, and cough). "Pneumonia days" was the number of days a calf had an ultrasound score of greater than 2. Treatment effects on categorical outcomes were assessed using relative-risk analysis and logistic regression. Treatment effects on continuous outcomes were assessed using t-test, Wilcoxon rank sum, and linear regression. Comparisons were made between individual groups and between combinations of different groups to improve power. "Low group" was defined as the combination of Groups 1 and 2. "High group" was defined as the combination of Groups 3 and 4. "Pooled treatment group" was defined as the combination of Groups 2 through 4.

Results

Overall, 58% of calves were shedding *C. parvum* on day 14. The risk of shedding in the pooled group (RR=1.08, 95% CI 0.87-1.33; *P*>0.49) and severity of shedding in *C. parvum*=positive calves (mean cycle threshold=35.5; *P*=0.74) did not differ from placebo. Treated and placebo calves had diarrhea for a median of 3 days (*P*>0.20). However, calves in Group 3 tended to have greater risk of developing diarrhea during the study compared to Group 4 calves (OR=1.9, 95% CI: 0.95-4.15, *P*>0.07). There was no difference in BRD days among treatment groups (*P*>0.84) and no treatment effect (*P*>0.12) on pneumonia days. Calves pooled in the low group had lower end weights (*P*<0.01) and average daily gain (*P*<0.01) and tended to have lower hipometer measurements (*P*>0.09) compared to calves in the high group.

Significance

This study provides selective evidence that feeding anti-IL-10 in pasteurized milk of dairy calves for 14 days may provide health and growth improvements, the mechanism of which has yet to be demonstrated.