PROFESSIONAL SERVICES
Boehringer Ingelheim Vetmedica, Inc.

TECHNICAL BULLETIN

Diaque™ Nutritional Supplement for Calves

Results of Two Studies

Key Points

Two recent studies performed in suckling calves indicated Diaque™ does not interfere with milk clot formation and calves with diarrhea that were supplemented with Diaque performed better than calves administered a market leading electrolyte solution.

- Oral rehydration solutions are used in calves with diarrhea as a supplemental source of energy and electrolytes to help offset dehydration and acidosis.
- Previous *in vitro* (laboratory) studies have shown oral rehydration solutions containing bicarbonate or citrate may markedly prolong, or inhibit, milk-clot formation.
- A study in suckling calves with an oral supplement containing bicarbonate, citrate and acetate (Diaque) showed there was no interference in the milk-clot formation in the abomasum.
- In a separate study, calves with diarrhea were supplemented with Diaque mixed in milk or administered Re-Sorb® mixed in water. The calves supplemented with Diaque had significantly improved average daily gain (ADG) over the entire feeding period when compared to the calves administered Re-Sorb.

Study 1 — Effect of Diaque on milk clotting, abomasal pH and abomasal emptying rate in suckling calves

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Objective

To determine the effect of administering only cow's milk or Diaque mixed in cow's milk on milk clotting, luminal pH and abomasal emptying rate in dairy calves.

Materials and Methods

Six male Holstein calves, 5-13 days of age, were used in a cross-over experimental design. An abomasal cannula was surgically placed in the calves. The calves were fed 2 liters of cow's milk with or without Diaque™ added. Clotting of milk was evaluated both *in vitro* and *in vivo* (in the animal). In addition, the pH of the abomasal content was continuously monitored and abomasal emptying rates were determined.

Results

Milk clotting time was increased *in vitro* by six minutes but not inhibited. The cow's milk, with and without Diaque, clotted *in vivo* within 15 minutes after the start of suckling. The addition of Diaque to cow's milk increased pH of the abomasal content approximately 0.2 pH units. The rate of abomasal emptying was slightly slowed in calves suckling cow's milk with Diaque.

Conclusions

Based on the results of previous *in vitro* studies on milk clotting, it has been widely believed that bicarbonate or citrate containing oral rehydration solutions should not be fed concurrently with cow's milk. However, the results of this study demonstrated that Diaque mixed with cow's milk did not clinically inhibit milk clot formation *in vivo* following suckling.

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Study 2 – A study to determine if Diaque™[1] mixed with milk and used as a nutritional supplement for calves with diarrhea improved body weight gain as compared to calves receiving Re-Sorb®[2] mixed in water and subsequently in milk. Data on file at BIVI

Objective

To evaluate body weight gain of diarrheic calves fed Diaque (a nutritional supplement) mixed with cow's milk as compared to calves with diarrhea that were administered Re-Sorb (an oral hydration, electrolyte product) mixed in water and subsequently milk.

Materials and Methods

Holstein calves that had received colostrum were used in this study. Birth weights were recorded and ear notches were collected to verify all calves enrolled in the study were negative for BVDv persistent infection. Blood was collected for total protein analysis. The calves were raised in a calf ranch setting and monitored for diarrhea until they were weaned at approximately 56 days of age. Calves with uncomplicated diarrhea (diarrhea and rectal temperature <103.5° F) were randomly assigned to one of two groups:

- Group 1 (180 calves): Upon enrollment, calves were orally administered 100 g of Diaque mixed in 2 quarts of warm pasteurized cow's milk. Diaque was administered twice daily for at least 2 days (up to a maximum of 8 days).
- Group 2 (164 calves): Upon enrollment, calves were orally administered one packet of Re-Sorb mixed in 2 quarts of warm water. This Re-Sorb solution was administered twice daily for two days. No milk or milk replacer was fed during this period. For the next 4 feedings, one quart of Re-Sorb solution mixed with one quart of warm pasteurized cow's milk was administered. If diarrhea persisted, the Re-Sorb solution mixed with one quart of warm milk was continued up to a maximum of 8 days.

All calves were weighed at birth, when diarrhea was detected and treatment was initiated, 5 days after treatment was initiated, and at weaning. Days on treatment, mortality, fecal score and dehydration score were recorded. All evaluations were performed by personnel that were blinded to the treatment groups. Fecal scores were based on a scale of 0 to 3: 0 = normal, 3 = severe, watery diarrhea. Dehydration was also scored on a scale of 0 to 3: 0 = diarrhea, minimal clinical signs, 3 = unable to rise, eyes sunken, skin tents and does not return.

Results

One calf was BVD PI positive and was removed from the site immediately. Average serum total protein values (Diaque = 5.6 g/dL, Re-Sorb = 5.5 g/dL, no significant difference) revealed passive transfer of immunity. There was no difference ($p>0.05$) between groups for mortality or dehydration scores. Calves administered Re-Sorb had significantly ($p=0.001$) more days on the electrolyte than calves administered Diaque (6.5 and 6.0, respectively). The average fecal score while receiving the supplement was 1.6 for calves in the Diaque group and 1.8 for calves in the Re-Sorb group ($p<0.0009$). There was a significant difference in average daily gain (ADG) over the entire feeding period. Calves supplemented with Diaque gained 1.17 pounds per day while the calves receiving Re-Sorb gained 1.12 pounds per day ($p = 0.044$). The ADG of comparable calves at the facility that did not suffer the stress of diarrhea was 1.21 lbs.

Conclusion

Calves with diarrhea that were administered a nutritional supplement (Diaque) gained more weight than calves administered an oral electrolyte (Re-Sorb). Based on a heifer development cost of $2.12 per day at this facility, the additional gain in the Diaque group (1.17 lbs. per day) versus the Resorb group (1.12 lbs. per day) equates to an increase in value of $4.62 at weaning. The cost of administering Re-Sorb for a longer period than Diaque (6.5 versus 6.0 days) was an additional $3.65 per calf. From placement to weaning, the total benefit of supplementing calves with Diaque versus administering Re-Sorb totaled $8.27 per calf.

[1] Diaque is a trademark of Boehringer Ingelheim Vetmedica GmbH. Diaque is a nutritional supplement for calves providing a source of energy and electrolytes.

[2] Re-Sorb is a registered trademark of Pfizer Animal Health. Re-Sorb is an oral hydration, electrolyte product providing a means of increasing absorption of water, energy sources and electrolytes.