

AQUATIZE, Diarrhea, Feed Conversion and Growth of Milk-Fed Calves

Report produced by
Dr. Edwin Coblentz, Americalf Research Farm
Mora, Minnesota, 1995

Edited by D.W. Fodge, Chief Scientist, DF International, LLC

CONCLUSIONS

Addition of Aquatize to the milk replacer and water fed to young Holstein bull calves reduced both the incidence and severity of diarrhea. The highest concentration of Aquatize fed at 2,000 ppm for 5 to 8 days and then at 400 ppm from days 10 to 21 produced the lowest number of cases of diarrhea (reduced about 45%), highest weight gains (12% improvement), and best-feed conversions (about 12% improvement).

INTRODUCTION

There is an urgent need for a non-antibiotic agent that is effective against both bacterial and viral diarrhea in milk-replacer-fed calves. Dairymen and commercial calf raisers throughout the America <world> are finding increasing cases of bacterial diarrhea in young calves, which do not respond favorably to the antibiotics prescribed by their local veterinarians. There <appear to be> new strains of diarrhea causing bacteria evolving which are more resistant to the antibiotics presently available. The objective of this study was to evaluate the effectiveness of Aquatize in controlling diarrhea when fed at different concentrations to young milk-fed calves. The results are very promising for the use of Aquatize in young milk-fed calves to combat the problems of diarrhea and poor growth rates.

MATERIALS AND METHODS

Three hundred twenty male Holstein calves were assigned randomly to one of eight treatment groups for a 5-week trial. The calves were purchased at sale barns in Central and Western Wisconsin on March 28, 29, and 30, 1995. An equal number of calves were assigned to each treatment as they arrived at the Americalf Research Farm. The calves weighed from 92 to 115 pounds (41.8 to 52.27 Kg) and were estimated to be between 3 to 7 days of age. All calves were housed in one environmentally controlled room with a temperature range of 60 to 70 degrees (F about 15 to 20 C) and a minimum of 4 air changes per hour. The calves were tethered with stainless steel neck chains over a wooden slatted floor in stalls that were 25 inches wide and 30 inches long (0.635 x 0.76 meters). Each stall had starter and water pails. The 50 week experiment started on

March 30, 1995, and ended on May 4, 1995. The eight treatment groups receiving different levels of Aquatize are summarized in Table 1. Calves were fed an Americalf milk replacer reconstituted to 12.5% solids in open pails twice daily at 0800 and 1700 hours according to the schedule given in Table 2. The composition of the milk replacer is given in Table 3. The source of fat in the fat supplement was 20% coconut oil, 40% lard, and 40% tallow.

The calves were fed a 16% starter for ad libitum intake starting on day 1 of the experiment. The starter fed was Calf Startena from Purina Mills. Feed consumption was measured weekly throughout the 5-week trial. Calves were individually weighed at the beginning and end of the trial. Fecal scores were recorded before AM and PM feedings using an index of 0 to 3 as follows: 0 = normal, 1 = soft, 2 = runny, and 3 = watery. Severity of diarrhea was measured as number of sieges of diarrhea (two feedings or more successively with scores of 3 or four feedings or more successively with scores of 2 or 2 and 3).

Note: Parts per million (ppm) dilutions are used in this report. 2000 ppm would equal 2000 liters of Aquatize + 998,000 liters of water (1:500 dilution), 400 ppm = 400 liters Aquatize raised to 1,000,000 volume with water (1:2,500 dilution), and 1,200 ppm would equal 1200 liters of Aquatize + 998,800 liters of water (1:833 dilution).>>

RESULTS AND DISCUSSION

Weekly starter consumption per group is summarized in Table 4. Each group consumed relatively similar amounts of starter each week with a rapid weekly increase in starter consumption. Each group had at least a ten-fold increase in starter consumption during the fifth week as compared to the first week. The Calf Startena was very palatable for all the calves in each group.

Body weights and weight gains for calves in each group are listed in Table 5. During the study four calves died due to complications from prolonged diarrhea followed by severe respiratory infections. The initial body weights were very similar as was the distribution of different weights of calves within each treatment group. The average weight gain for the control Group 1 was 8.9% less than average of the Aquatize groups. Calves in Group 7 that received the most Aquatize were 12.7% ($p < 0.05$) heavier than the control calves at the end of the 5-week period.

Feed conversions for each treatment group are given in Table 5, last column. Feed conversions for calves in each treatment group were determined by dividing the average total feed consumed/calf (see Table 4) by the average weight gain. The feed conversion for the control Group 1 was 8.2% higher than the overall average of the Aquatize groups. The overall trend was that the feed conversions improved as the concentrations of Aquatize increased from 0 to 2,000 ppm in the liquid portion of the

diet. The feed conversions were improved by approximately 0.1 feed/gain for each group within the three higher levels of Aquatize that were fed the starting level of Aquatize for 8 days, 800 ppm for 2 days, and 400 ppm until day 21. The best feed conversion was observed in Group 7 which was 12.5% better than the feed conversion of the control group.

The incidence and severity of diarrhea was itemized and an average of 41% of the calves in groups 1 to 6 had diarrhea while an average of 25% had diarrhea in groups 7 and 8, Table 6. Likewise, the average fecal score for groups 7 and 8 was dramatically lower (2.89 vs 5.35) than the average of groups 1 to 6. This indicates that the 42 calves in groups 7 and 8 averaged less than one fecal score of 3 and groups 1 to 6 averaged less than two fecal scores of 3. The severity of diarrhea shows that calves in all groups had less than one bout with watery diarrhea that lasted two feedings or a combination of runny and watery diarrhea that lasted four feedings. Diarrhea adversely affected the weight gains the most for calves in the control group. The scouring calves receiving the higher concentrations of Aquatize were the least affected by diarrhea, and this was dramatically apparent after 5 days into the experiment as 15 calves in Group 1 had diarrhea whereas only 5 calves in Group 7 had diarrhea. The initial weight of the calves did not appear to be a significant factor for whether or not calves developed scouring the scouring calves.

CONCLUSIONS

Addition of Aquatize to the milk and water fed to young Holstein bull calves reduced both the incidence and severity of diarrhea. The highest concentration of Aquatize fed at 2,000 ppm for 5 to 8 days and then at 400 ppm from days 10 to 21 produced the lowest number of cases of diarrhea, highest weight gains, and best-feed conversions.

Table 1: Concentrations of Aquatize in Milk and Water for 8 Treatment Groups

<u>Group</u>	<u>Comment</u>	<u>PPM First 10 Days</u>		<u>PPM Last 11 Days</u>
1	Control	No Aquatize		No Aquatize
2	Aquatize	800 ppm		200 ppm
3	Aquatize	1,200 ppm/8 d,	800 ppm/2 d	400 ppm
4	Aquatize	1,200 ppm/5 d,	800 ppm/5 d	200 ppm
5	Aquatize	1,600 ppm/8 d,	800 ppm/2 d	400 ppm
6	Aquatize	1,600 ppm/4 d,	1,200 ppm/6 d	200 ppm
7	Aquatize	2,000 ppm/8 d,	800 ppm/2 d	400 ppm
8	Aquatize	2,000 ppm/3 d,	1,200 ppm/7 d	200 ppm

Table 2: Milk Replacer Consumed by Calves

<u>Days on Test</u>	<u>Replacer Per Day</u> (ml)	<u>Cumulative Replacer</u> (liters)
1-3	318	(0.954) = 0.954
4-7	409	(1.636 + 0.954) = 2.590
8-14	500	(3.00 + 2.59) = 5.590
15-21	568	(3.976 + 5.59) = 9.566

Table 3: Composition of the Milk Replacer

<u>Ingredient</u>	<u>Percent in Replacer</u>
NonFat Dry Milk	25.0
Dried Whey Protein Concentrate	16.2
Dried Whey	31.3
Dried Fat (13% CF/60% Fat)	25.0
Vitamin/Mineral Premix ¹	2.5
Crude Protein, %	21.0
Crude Fat, %	16.0

1 The Vitamin/Mineral premix provides vitamins and minerals at levels recommended by the National Research Council, 1988. Nutrient Requirements of Dairy Cattle.

Table 4: Weekly Consumption of Milk Replacer by Treatment Groups

	<u>Week on Test</u>					<u>Avg/Calf</u> (Kg)
	<u>1</u>	<u>2</u>	<u>3</u> (Kg/Group)	<u>4</u>	<u>5</u>	
1	38.1	82.5	140	221.4	400.7	39.18
2	36.7	82.6	154.1	245.9	376.1	39.50
3	34.5	83.7	142.1	222.9	369.3	38.50
4	39.3	82.7	127.0	219.1	375.7	39.27
5	32.8	79.0	135.7	230.2	355.5	38.50
6	38.7	71.4	137.0	235.5	407.3	40.23
7	34.0	73.4	129.9	229.6	391.4	38.64
8	36	71.4	138.9	249.7	394.3	39.36
Avg	36.3	80.2	137.7	231.8	383.8	

Table 5: Summary of Individual Weight and Feed Conversion per < > Group

<u>Group (# Calves)</u> <u>(%)</u> <u>F/G</u> (Final # Calves)	<u>Initial Wt</u> (Kg/Calf)	<u>Final Wt</u> (Kg/Calf)	<u>Gain</u> (Kg/Calf)		<u>Advantage</u>
1 (42)	47.0	62.318	15.318	-----	2.56
2 (42)	46.95	63.136	16.186	0.868 (5.6)	2.44
3 (42)	47.0	63.363	16.364	1.046 (6.8)	2.35
4 (40)	47.045	63.182	16.137	0.819 (5.3)	2.43
5 (41)	46.95	63.909	16.959	1.641 (10.7)	2.27
6 (41)	47.0	63.954	16.954	1.636 (10.7)	2.37
7 (42)	46.954	64.227	17.273	1.955 (12.8)	2.24
8 (42)	47.0	63.772	16.772	1.455 (9.5)	2.35

Table 6: Prevalence of Scours, Fecal Scores, Severity of Diarrhea, and Weights of Scouring Calves

<u>Group Scouring</u> Number	<u>Fecal ScourSeverity</u> (Calf Nos.) Average	<u>Initial Wt.</u> Diarrhea	<u>Weight Gain</u> (Kg)
18	6.0 0.38	46.23	13.0
14	4.1 0.24	46.91	16.1
17	6.4 0.48	45.50	14.23
18	4.2 0.17	45.86	14.68
18	6.6 0.48	47.68	17.41
18	4.8 0.21	47.36	16.27
11	3.0 0.21	46.14	16.00
10	2.8 0.19	47.5	17.86