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Abstract

The objectives of this experiment were to evaluate bovine and porcine plasma proteins as sources of protein for calf milk replacers and to evaluate a commercial probiotic. Four replacers were compared; an all milk protein control, two replacers with 25% of protein from bovine plasma protein or porcine plasma protein, and a replacer identical to the control except that it contained a probiotic (Biomate FG, Chr. Hansen's Laboratory) instead of antibiotic. The 120 bull calves (7 ± 3 days of age) were divided into four equal groups, and calves from each group were fed 4 quarts per day of one of the replacers until weaned and all of a commercial starter they would eat. For the control, porcine plasma, bovine plasma, and probiotic replacer groups, respectively, during the 6-wk period, the weight gains were 23.8, 29.5, 27.9, and 22.2 lb. Starter consumptions were 53.7, 67.8, 58.7, and 54.6 lb, respectively. Deaths were 2, 1, 3, and 0, respectively. Increases in wither height were similar among diets. Increases in weight gains and starter consumed by calves fed the plasma proteins compared to controls approached significance (P = .10); differences between control and probiotic replacer groups were not significant.; Dairy Day, 1994, Kansas State University, Manhattan, KS, 1994;

Keywords

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EVALUATION OF MILK REPLACERS CONTAINING NEW PROTEIN SOURCES AND A PROBIOTIC

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Summary

The objectives of this experiment were to evaluate bovine and porcine plasma proteins as sources of protein for calf milk replacers and to evaluate a commercial probiotic. Four replacers were compared; an all milk protein control, two replacers with 25% of protein from bovine plasma protein or porcine plasma protein, and a replacer identical to the control except that it contained a probiotic (Biomate FG, Chr. Hansen's Laboratory) instead of antibiotic. The 120 bull calves (7 ± 3 days of age) were divided into four equal groups, and calves from each group were fed 4 quarts per day of one of the replacers until weaned and all of a commercial starter they would eat. For the control, porcine plasma, bovine plasma, and probiotic replacer groups, respectively, during the 6-wk period, the weight gains were 23.8, 29.5, 27.9, and 22.2 lb. Starter consumptions were 53.7, 67.8, 58.7, and 54.6 lb, respectively. Deaths were 2, 1, 3, and 0, respectively. Increases in wither height were similar among diets. Increases in weight gains and starter consumed by calves fed the plasma proteins compared to controls approached significance (P = .10); differences between control and probiotic replacer groups were not significant.

(Key Words: Milk Replacers, Calves, Plasma Proteins, Probiotics.)

Introduction

Milk replacers are fed to calves when milk is not available, because it might be more economical, or for other reasons. Because the very young calf is limited in its ability to utilize proteins, it has been difficult to find proteins, other than those from milk products, that can be used in milk replacers. Some products from soybeans (soy flour, soy protein concentrate, soy protein isolate) are used in calf milk replacers with varying degrees of success. Recently, improved plasma proteins (which are by-products of the cattle and swine slaughter industries) have become available and have shown promise as protein sources for pigs. Research is needed to evaluate these products as protein sources for baby calves.

Many of the microorganisms that are found in the intestines of animals are beneficial. Theoretically, increasing the quantity of these microorganisms will benefit the animal, especially if some condition had existed that caused a decrease in quantity. Probiotics are products that contain one or more of these beneficial microorganisms and when administered to animals, will be beneficial. Several of these products are on the market, but most have not been tested adequately.

Our objectives were to determine the effect of replacing milk protein in calf milk replacers with plasma proteins from both porcine and bovine sources on growth and performance of

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dairy calves and to determine the efficacy of one commercial probiotic.

Procedures

Holstein bull calves (n=120) approximately 7 days of age were purchased in Wisconsin and transported to Cottonwood Farms, a commercial calf growing facility at McLouth, Kansas. Upon arrival they were unloaded into individual hutches bedded with straw. The calves were weighed and assigned to four equal groups. Each group was assigned to receive either an all-milk protein milk replacer (control), a replacer in which 25% of the protein came from porcine plasma protein, one containing 25% bovine plasma protein, or a replacer identical to the control except that it contained .25% Biomate FG (Chr. Hansen's Biosystems, Milwaukee, WI) instead of antibiotic. The milk replacers were fed twice daily until the calves were weaned, which was when they consumed at least 1.5 lb of starter daily. A commercial calf starter was always available.

Body weights were recorded weekly, and wither heights were recorded at the beginning and end of the experiment.

All calves received electrolytes on arrival, vaccinations, and were castrated 20 days after arrival. Blood samples were collected from a subsample of each group at 1 and 10 days of age and analyzed for 16 metabolites to determine if differences existed.

Results and Discussion

Overall health and mortality rate of the calves were acceptable for calves that had been collected from various farms and shipped long distance, considering also that they were subjected to the unusual early storm of fall 1991. The deaths per group (control = 2, porcine plasma = 1, bovine plasma = 3, probiotic = 0) were not different enough to be considered conclusive.

Weekly cumulative weight gains of the calves are shown in Table 1. All gains were somewhat low, partly because the protein content of the milk replacers was kept low to allow expression of differences in protein quality and partly because of the experimental stresses. The differences in gains were not significant, but the difference between gains of calves fed either plasma protein and those fed the control milk replacer approached significance (P=.10).

Starter consumption (Table 2) did not differ by treatment. As expected, calves that tended to gain more tended to eat more starter. Age at weaning did not differ significantly by treatment.

Increases in wither height were 5.8, 5.3, 6.9, and 5.8 inches for the control, porcine plasma, bovine plasma, and probiotic replacers, respectively, and were similar. When there were significant differences in blood metabolites, by treatment, there were no apparent explanations for why those metabolites (or measurements) should have been affected by treatment.

These results demonstrate that plasma proteins can successfully supply up to one-fourth of the protein in a milk replacer. Further research is needed to determine if the extra gain by calves fed plasma proteins, especially porcine protein, is repeatable and if feeding the plasma protein results in any benefits to health of calves.

Results from use of the probiotic were inconclusive. If there were benefits from use of the antibiotic in the control replacer (the experiment was not designed to measure that), then those same benefits were realized from use of the probiotic. More research is needed to evaluate the possible benefits from using the probiotic under different conditions, especially when disease is a major problem.

Table 1. Cumulative Weight Gains of Calves[a]

	Week					
Replacer	1	2	3	4	5	6
	---------- lb ----------					
Control	-.9	-2.4	2.6	10.3	20.9	23.8
Porcine plasma	-.2	-.9	5.5	15.0	25.3	29.5
Bovine plasma	-.2	-.9	5.1	13.2	24.0	27.9
Probiotic	.2	-1.3	3.5	11.7	19.8	22.2
SE	.7	.9	1.3	1.8	2.2	2.4

[a]Differences between treatments were not significant

Table 2. Cumulative Consumption of Starter by Calves[a]

	Week					
Replacer	1	2	3	4	5	6
	---------- lb ----------					
Control	.1	1.1	4.2	13.6	30.6	53.7
Porcine plasma	.2	1.5	6.6	18.7	38.9	67.8
Bovine plasma	.1	1.5	5.9	15.6	33.2	58.7
Probiotic	.2	1.5	5.5	15.6	31.2	54.6
SE	.1	.2	.9	2.0	3.3	4.4

[a]Differences between treatments were not significant