PERFORMANCE AND RUMINAL MICROBIAL AND METABOLIC DEVELOPMENT OF YOUNG CALVES FED DIETS CONTAINING ASPERGILLUS ORYZAE EXTRACT

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Summary

Seventy-three, neonatal, Holstein, heifer calves in one experiment and 45 neonatal, Holstein, bull calves in another were used to study the effects of dietary Aspergillus oryzae extract (Amaferm) on calf performance. Forty of the heifer calves were selected to study the effects on ruminal microbial and metabolic development. In general, Amaferm-supplemented calves had greater ruminal microbial activity than the calves fed no Amaferm. For the most part, growth and feed intake were not affected.

Introduction

Many feed additives of microbial origin have come into the market. These additives contain either the microorganisms, the dry products of microorganisms, the medium in which they grew, and/or the residues of their metabolism. The microorganisms used are molds, yeast, and/or bacteria. One such product is Amaferm, a fermentation extract of the mold Aspergillus oryzae[1]. The addition of Amaferm to the adult ruminant diet has been reported to increase digestion of dry matter, fiber, and crude protein in vivo and in vitro. Milk production and percentage milk fat have been increased by Amaferm supplementation in dairy cows.

Amaferm supplementation would be beneficial to the neonatal calf, if dry feed consumption could be stimulated at an early age, resulting in accelerated rumen motility, muscle development and ruminal microbial activity. In addition, early dry feed consumption can lead to early weaning, which is beneficial because of reduced labor and feed costs and because calves that have been weaned have fewer digestive disorders.

Amaferm has been shown to stimulate rumen bacterial activity. If Amaferm could stimulate microbial development, a resulting increase in ruminal metabolic activity should occur and an increased dry feed intake and early weaning might be possible. Therefore, the purpose of this study was to determine the effects of supplemental Amaferm on calf performance and ruminal microbial and metabolic development.

[1]Biozyme Enterprises, Inc., St. Joseph, MO 64504.

Procedures

Seventy three, neonatal, Holstein, heifer calves (Exp. 1) and 45 neonatal, Holstein, bull calves (Exp. 2) were assigned to four starter diets formulated to obtain Amaferm consumption of .5, 1, or 3 g per calf per day plus a control. Calves were fed milk at 8% of birth weight daily and allowed to consume starter and a mixture of 1/3 alfalfa and 2/3 brome hay ad libitum. Weaning occurred when calves consumed 550 g of starter on 2 consecutive days. Calf weight gain and feed consumption were recorded weekly. Forty of the heifer calves were selected randomly to study the effect of Amaferm on microbial and metabolic development (Exp. 3). Ruminal fluid samples were collected 3 h postfeeding via stomach tube at 2, 4, 6, 8, and 10 wk of age for analysis of fermentation products and for bacterial enumerations.

Results and Discussion

Amaferm-supplemented calves and control calves had similar dry feed intakes and weight gains with the exception of the subset of 40 heifer calves used for microbial and metabolic enumerations (Table 1). All heifer calves supplemented with Amaferm were weaned at least 1 wk earlier ($P<.10$) than unsupplemented calves (Table 2), with no apparent decrease in health (measured by fecal and general appearance scores) or feed intake.

In Exp. 3, Amaferm-supplemented calves had higher ($P<.05$) total VFA concentrations than control calves (Figure 1); however, supplementation did not affect the acetate to propionate ratio. Despite the higher VFA concentration, the ruminal pH of Amaferm supplemented calves and control calves was similar. Calves supplemented with Amaferm had higher ($P<.10$) anaerobic bacterial populations than control calves (Figure 1). In addition, counts of bacteria that digest pectin and hemicellulose were also higher ($P<.10$) and cellulolytic bacteria tended to be higher for calves supplemented with Amaferm vs control calves (Figure 1).

Conclusion

Amaferm-supplemented calves were weaned earlier than control calves, with no weight loss or increased incidence of illness, and had higher microbial activity in the rumen than calves fed no Amaferm. Calf weight gain, feed intake or dry feed-to-gain ratios were unaffected by Amaferm supplementation for the 10-week trial, except in the heifer subset.

Table 1. Average Weekly Dry Feed Intake and Weight Gain of Control or Amaferm-Supplemented Calves

	Treatment				
Item	Control	Low Amaferm	Moderate Amaferm	High Amaferm	SE[1]
Intake, lb					
Exp. 1 - Heifers (n=73)	17.2	19.1	18.3	19.1	2.2
Exp. 2 - Bulls (n=40)	18.7	19.1	19.4	17.6	5.5
Exp. 3 - Heifers (n=40)	15.4[a]	19.4[b]	19.4[b]	20.5[b]	1.5
Gain, lb					
Exp. 1 - Heifers	7.9	8.4	8.4	9.0	1.8
Exp. 2 - Bulls	8.4	9.7	9.5	8.8	3.3
Exp. 3 - Heifers	7.5[a]	8.8[bc]	7.7[ab]	9.2[c]	1.8

[1]Standard error.
[abc]Means within row with different superscripts differ (P<.10).

Table 2. Effect of Amaferm on Weaning Date of Control or Amaferm-Supplemented Calves

	Treatment			
Item	Control	Low Anaferm	Moderate Amaferm	High Amaferm
	---------- Week weaned ----------			
Exp. 1 - Heifers	5.40[a]	4.55[b]	4.60[b]	4.63[b]
Exp. 2 - Bulls	5.50	4.73	4.75	5.10
Exp. 3 - Heifers	5.67[c]	4.50[d]	4.13[d]	4.18[d]

[ab]Means within row with different superscripts differ (P<.05).
[cd]Means within row with different superscripts differ (P<.01).

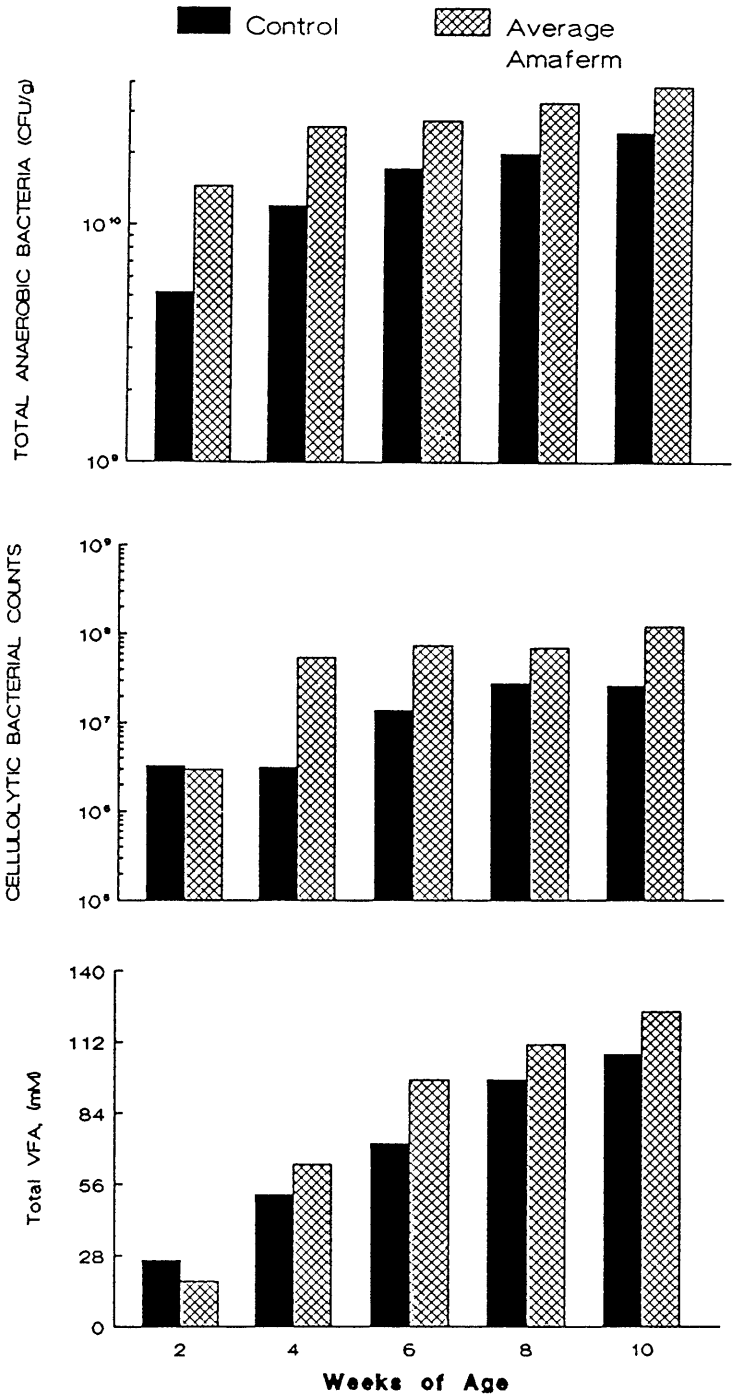

Figure 1. Ruminal VFA (treatment effect, P<.05) and semilog plots of total anaerobic (treatment effect, P<.10)) (CFU/g) and cellulolytic bacteria (treatment effect, P<.10) (MPN) in Amaferm supplemented or unsupplemented calves.