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EFFECT OF RUMINAL PROTOZOA ON PERFORMANCE OF EARLY-WEANED CALVES

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Summary

Twenty newborn bull calves assigned to two groups, protozoa-free or protozoa-inoculated, were used to determine the effects of ruminal protozoa on performance of early weaned calves. Calves in the protozoa group were inoculated via stomach tube with a suspension of ruminal protozoa at weekly intervals until a viable population was established. Calves were evaluated weekly for weight gain and feed intake. Feed intake and weight gain were not significantly different between the groups but tended to be higher in protozoa-inoculated than protozoa-free calves.

Introduction

Calves weaned early consume dry feed at an earlier age than conventionally weaned calves. This accelerated dry feed consumption contributes to an earlier ruminal microbial development. We have determined that adequate bacterial populations are present in the rumen of calves at a very early age, and subsequent bacterial development is stimulated by increased dry feed consumption. However, no ruminal protozoa were detected in the calves weaned early, perhaps because those calves were isolated from adult ruminants. Ruminal establishment of protozoa in the young ruminant appears to require some form of physical contact with adult ruminants.

Because common dairy management practices include raising calves in relative isolation from mature ruminants, calves may likely remain protozoa free for many weeks. It is not known what influence protozoa may have on growth of newborn calves. Therefore, we investigated the influences of protozoa on growth and performance of early weaned calves.

Procedures

Twenty newborn, Holstein bull calves were separated from their dams within 24 h postpartum and placed in individual calf hutches. Calves were assigned to two groups, protozoa-free and protozoa-inoculated, and physical contact of calves between groups was prevented. Colostrum was fed to all calves until 3 d of age, and then whole milk (8% birth wt.) was fed until calves were weaned at 3 wk of age. Calves in both groups were fed a prestarter diet from day 3 until they reached a daily intake of 227 g. They were then fed a mixture of 227 g of prestarter daily and all the calf starter (2) they would eat until 6 wk of age, after which they were given ad libitum access to only the starter diet. Beginning at 1 wk of age, calves in the faunated group were ruminally inoculated via stomach

tube with a suspension of ruminal protozoa. The inoculation was repeated weekly until a viable ruminal protozoa population was established. This required up to 6 wk for many of the calves. The protozoal suspension was prepared from ruminal fluid collected from a steer fed 50% grain and 50% alfalfa diet. The ruminal fluid was strained through a layer of cheesecloth and 1500 ml was mixed with 750 ml of mineral buffer (pH 6.8) and .1% oxytetracycline in a 2 l separatory funnel, and incubated at 39 C. After 1 h of incubation, the white layer of protozoal sediment was removed and suspended in mineral buffer and inoculated into the rumen.

Results and Discussion

Although calves were given a heavy inoculum of protozoal suspension, repeated administration was required to get the protozoa established in the rumen. In most calves, protozoa were consistently present only after 5 wk of age (Table 1). Possibly, this was due to unfavorable conditions in the rumen of young calves. The ruminal protozoal numbers tended to increase weekly after 6 wk of age (Table 1). Because many calves did not have a viable population of protozoa until 6 wk of age, performance data of calves from 6 wk of age are presented.

Calves inoculated with protozoal suspension consistently had higher body weights and feed intake, and in most instances, higher weekly weight gain than protozoa-free calves; however, differences were not significant (Table 2). Previous research has shown that ruminal protozoa may have positive, negative, or no effect on weight gain and performance of ruminants. These conflicting data on the role of ruminal protozoa have remained largely unexplained. Apparently, there are several factors, or a combination of factors, that determine effects of protozoa on performance.

Table 1. Ruminal protozoal counts in calves inoculated with protozoal suspension

Age, week	Number per gram of ruminal fluid
1	0
2	88
3	44
4	180
5	40
6	140
7	195
8	668
9	460
10	448
11	626
12	132.3

Table 2. Weekly body weight, weight gain, and feed intake of protozoa-free or protozoa-inoculated calves

Age, wk	Body weight, kg		Weekly weight gain, kg		Weekly feed intake, kg	
	protozoa-free	protozoa-inoculated	protozoa-free	protozoa-inoculated	protozoa-free	protozoa-inoculated
0	41.0	41.2	—	—	—	—
6	56.2	60.8	4.1	5.8	10.7	12.3
7	62.6	68.0	6.4	7.2	13.1	15.2
8	69.0	74.2	6.3	6.2	15.3	17.3
9	75.7	80.9	6.7	6.7	18.4	18.3
10	84.0	87.1	8.4	6.2	20.9	21.1
11	91.9	96.7	7.9	9.5	23.2	24.0
12	100.5	106.1	8.6	9.6	24.7	26.3