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Feeding a Microbial Product Reduces Scours but Does Not Improve Weight Gain in Dairy Calves

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INTRODUCTION

The period from birth to weaning is the time of greatest stress and metabolic challenge to young dairy calves. According to national surveys of dairy producers by the National Animal Health Monitoring System, mortality of dairy heifers from birth to weaning was 8.4% in 1991 and 11.0% in 1995. In contrast, death loss during comparable years was only 2.2% and 2.4%, respectively, for heifers from weaning to calving.

A major cause of high mortality rates from birth to weaning is to due to diarrhea (scours) and respiratory problems. In the survey noted above, these two factors accounted for almost 75% of all deaths in pre-weaned calves, with diarrhea being the primary cause at 52.2%. Because of the key importance of diarrhea as a cause of high mortality in dairy calves, dairy producers are continually investigating methods to control diarrhea.

One strategy for lowering diarrhea occurrences in dairy calves has been the feeding of products containing direct-fed microbials (DFM). When consumed, these beneficial bacteria pass through the stomach to the lower gut where they facilitate establishment of a normal intestinal microbial population. Conditions such as antibiotic use and stress can adversely affect these normal lower gut bacteria and lead to establishment of undesirable pathogens that may cause diarrhea and/or poor nutrient absorption. Some of the more common microbes used include *L. acidophilus*, *L. casei*, *E. diacetylactis* and *B. subtilis*.

Data on the efficacy of DFM in dairy calves raised on large dairy farms typical of those in the southern part of the Central Valley of California are lacking. For this reason, a study was initiated to explore the use of a DFM product for dairy calves raised on a large commercial dairy in Fresno County, CA.

METHODS

This study utilized 58 Holstein heifer calves born between July 2 and July 24, 1999 on a commercial 1500 cow dairy. Within 4 to 6 h of birth, all calves received 68 oz of colostrum, and their navels were dipped with tincture of iodine. Within 12 h, calves were ear tagged, weighed, and allotted randomly into one of two groups being: Control (no feed additive) or Microbial Product (MP). Calves in the MP treatment were fed five g/head once daily of a commercial direct-fed microbial product (Conlic, Grotek, Inc., Alhambra, CA). The MP consisted of *Bacillus subtillis* fermented soybean meal dehydrated (10^7 CFU/g) and aged garlic powder.

The treatment period was eight weeks, and body weights (BW) and wither heights were measured weekly. All calves were housed in individual enclosed calf hutches (78 x 39 x 39 inches high) with an aluminum roof which covered 60% of the floor area. Hutches were arranged to prevent contact from adjoining calves. Calves were monitored daily for health with treatments recorded for each calf. During the first 3 wk of life, calves were fed reconstituted commercial milk replacer (APC Choice™ 20/20 Calf Formula, National Protein Corp., Corona, CA) twice daily in open buckets at 5% of BW per feeding. The guaranteed nutrient analysis of this unmedicated, milk replacer was crude protein (CP), 20.0 % minimum; crude fat, 20.0 % minimum; and crude fiber (CF), 0.10 % maximum.

After 3 wk, calves were fed pasteurized waste milk in addition to, or as a replacement for, milk replacer. Water and a grain starter mix were available ad libitum throughout the study, and no hay was provided. Composition of the commercial starter mix on a dry matter (DM) basis was CP, 20.7%; acid detergent fiber, 6.5%; and total digestible nutrients, 86.1%. Milk and grain starter intake were recorded daily. Calves fed MP consumed it once daily with the allotment of milk.

Feces were scored three times weekly during the first 28 d of life on a numerical score of 1 to 4 (1: normal, 2: soft, 3: runny, and 4: watery). Fecal grab samples were collected from a group of 8 calves per treatment at assignment, and at 14 and 28 d, for total coliform and lactobacilli counts.

Statistically significant differences between treatments were determined by ANOVA *F* test. Both experimental groups contained 29 female calves. One treatment calf died 14 d after birth, and the cause of death, determined by necropsy, was predominately E. coli septicemia. Data obtained from this calf was not included in the statistical analysis.

RESULTS

No differences occurred between treatments in actual BW at any week during the trial, and the pattern of growth is in Figure 1. The ADG did not differ between groups overall (Table 1), and there were no differences in wither heights. Control and treatment calves consumed similar quantities of waste milk or milk replacer. Intake of calf starter and feed efficiency did not differ between treatments.

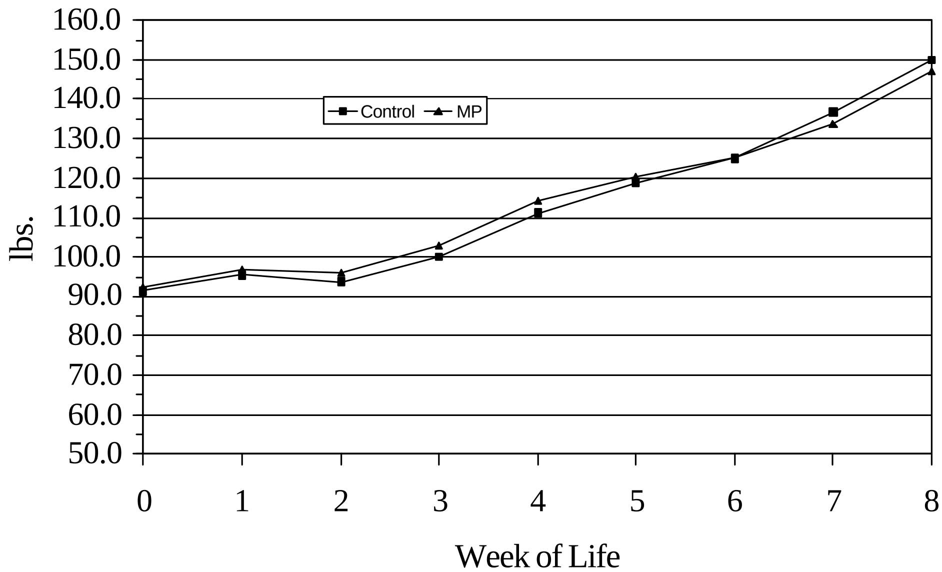

Figure 1. Mean change in body weight of calves fed a microbial product or the control diet.

Table 1. BW gain, DMI, feed efficiency and wither height of calves fed a microbial product.

	Treatments		
	Control	MP	SE
Calves started	29	29	
Calves completed	29	28	
Initial weight, lb	91.4	92.4	2.4
Final weight, lb	150.0	147.2	3.4
Average daily gain, lb/d	1.05	.98	.10
Wither height, inches			
Week 1-4	29.8	29.8	.11
Week 5-8	31.5	31.3	.20
Starter intake, lb DM/d	1.15	1.12	.08
Feed efficiency, lb DMI/lb gain			
Week 1-4	.17	.30	.05
Week 5-8	1.45	1.44	.31

Calves fed the MP had lower fecal scores from wk 1 to 3 (Figure 2), with wk 2 being significantly lower (P < 0.01), indicating that MP treated calves experienced fewer onsets of diarrhea. Calves fed MP had significantly (P < 0.11) lower coliform counts on day 14 and lower absolute overall coliform counts than controls (Table 2). Fecal lactobacilli counts were not affected by MP feeding. Lower fecal scores for MP fed calves suggest that the MP fed calves had a better balance of gut microflora than control calves since coliform numbers were lower for treated calves. When intestinal coliform numbers rise, the intestinal balance of beneficial to pathogenic bacteria is reduced and diarrhea results.

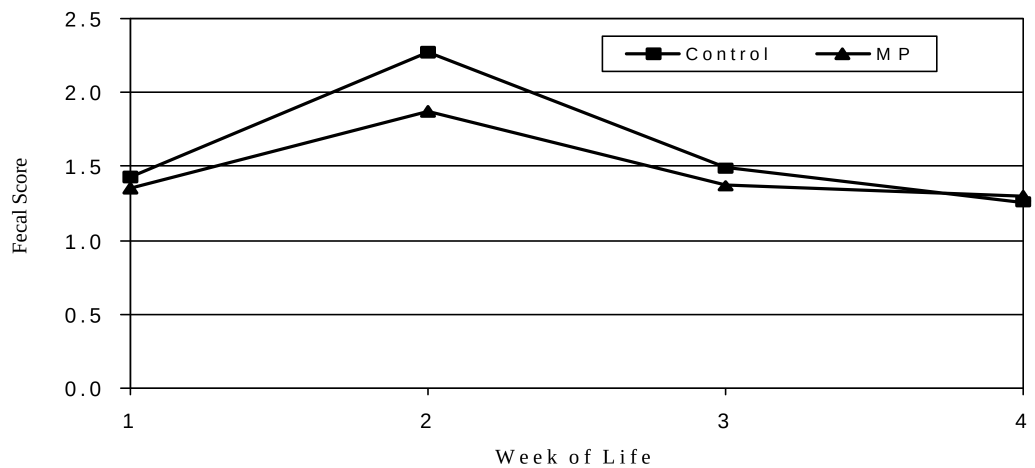

Figure 2. Scour index of calves fed a microbial product.
(Fecal score: 1 = normal, 2 = soft, 3 = runny, 4 = watery)

Table 2. Fecal microbial counts in feces of calves fed a microbial product.

	Treatments		
	Control	MP	SE
	-- $\log_{10}$ of count/g of feces --		
Coliform			
0	5.97	5.58	0.38
14 [a]	7.64	6.99	0.38
28	7.24	6.66	0.38
Overall	6.95	6.41	0.22
Lactobacilli			
0	6.74	6.26	0.35
14	8.24	8.02	0.35
28	6.97	6.76	0.35
Overall	7.32	7.01	0.20

[a,b] Means differ (P<0.11).

Control calves had higher absolute days treated for various health conditions, primarily scours (Table 3). During wk 1 to 4 of the trial, calves on the MP that were treated for health problems had a significantly higher BW gain compared to control calves that were treated for similar health conditions. There were no differences in ADG for calves not treated for health conditions between treatment groups. Conversely, control calves treated for health problems had a higher ADG during wk 5 to 8. The ADG for calves not treated for any health condition was similar between treatments.

During wk 1 to 4, average daily grain starter intake was numerically higher for MP fed calves that were treated for health problems. No differences were noted for those calves not treated for health problems for either experimental group. For wk 5 to 8, no differences were noted for calves treated, or not treated, for health problems.

Table 3. Health disorders of calves fed a direct-fed microbial product.

	Treatments		
	Control	MP	SE
Calves treated	15	13	--
Average days treated	4.6	4.1	0.4
Avg. daily gain (lbs.), wk 1 to 4			
Calves treated [a]	0.57	0.77	0.08
Calves not treated	0.85	0.79	0.08
Avg. daily gain (lbs.), wk 5 to 8			
Calves treated [b]	1.40	1.01	0.10
Calves not treated	1.36	1.32	0.11
Avg. daily starter intake (lbs. DM), wk 1 to 4			
Calves treated	0.28	0.38	0.05
Calves not treated	0.33	0.33	0.35
Avg. daily starter intake (lbs. DM), wk 5 to 8			
Calves treated	1.98	1.84	0.17
Calves not treated	2.10	1.90	0.17

[a] Means differ ($P < 0.10$), [b] Means differ ($P < 0.01$).

IMPLICATIONS

Results suggest that this direct-fed microbial product, as used in our study, lowered incidences of scours in young dairy calves. Lower numbers of coliform bacteria in DFM fed calves may have contributed to better health, as scouring calves quickly become dehydrated, with potential losses of 6% to 12% of their body fluids in one day. The key to successful treatment is early detection and administration of oral products containing nutrients and electrolytes.

Approximately half of dairy producers surveyed by Goodger and Theodore did not use oral electrolyte's to treat scouring calves. Furthermore, it is amazing that only 21% of 1811 dairy producers surveyed by the National Animal Health Monitoring System in 1993 relied on oral rehydration or electrolyte therapy. Results from both surveys indicated that dairy producers rely heavily upon antibiotics to treat scours, a practice that is generally discouraged due to risks of antibiotic residues in tissues. Increased scrutiny of use of antibiotics in animal feeding systems suggests that use of direct-fed microbials may provide a partial replacement for antibiotics, especially as it relates to raising healthy dairy calves.

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