The Value of Milk Replacers in Raising Dairy Calves for Herd Replacements

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Many dairymen realize that feeding whole milk to dairy calves can be quite expensive, because of the high value of fluid milk for human consumption. Consequently, formulas have been designed to replace whole milk in the feeding of baby calves.

The question which dairymen often raise is the economics and performance of calves fed milk replacer as compared to calves fed whole milk. Research workers from other stations have shown that calves can be fed milk replacers up to weaning age and normal growth obtained (2, 4, 5, 6). Likewise, good healthy calves can be grown without large amounts of whole milk (1). Some research workers (2, 5) have found that calves fed milk replacers grow more slowly than calves fed whole milk. This research data indicates that milk replacers can definitely be substituted for whole milk, however, there is some question as to which system gives the best performance in calves. There is also some doubt as to the effect of milk replacers on the incidence and severity of scours. Murdock et. al. (4) reported replacer feeding increased the incidence and severity of scours whereas others (3) claim a reduction in scours.

This paper reports experimental work comparing the economic gains and performance of calves fed milk replacer with calves fed limited whole milk.

EXPERIMENTAL PROCEDURE

Forty Holstein, Jersey and Guernsey calves from the Illinois State University Farm were randomly assigned, over a period of 15 months, either to milk replacer or whole milk. Thus 20 calves, equally divided as to sex received milk replacer and 20 calves received whole milk.

Calves received colostrum for the first three days of life and then switched directly to milk replacer or whole milk. They were weighed, and measured for height at withers and for heart girth circumference at 7 weeks of age. The daily intake of milk replacer or whole milk was recorded. The feed schedule for the calves is shown in Table 1. The amount of milk replacer or whole milk was gradually increased up to 3 weeks of age and then gradually decreased. With this method the calves were eating between 3 and 3½ pounds of calf starter per day at weaning age. Whenever the calves showed signs of scouring the amount of replacer or whole milk was reduced.

TABLE 1

FEEDING SCHEDULE FOR CALVES RECEIVING MILK RELACER AND WHOLE MILK

	Replacer				Whole Milk	
	Holstein		Jer. & Guern.		Hol.	Jer. & Guern.
Day of Age	rep lb.-day	water lb.-day	rep. lb.-day	water lb.-day	lb.-day	lb.-day
0-3	Colostrum		Colostrum		Colostrum	Colostrum
4-7	.73	7	.52	5	7	5
7-14	.94	9	.62	6	9	6
14-21	1.04	10	.73	7	10	7
21-28	.83	8	.73	7	8	7
28-35	.62	6	.52	5	6	5
35-42	.42	4	.42	4	4	4
42-49	.21	2	.31	3	2	3

Good quality alfalfa hay and a dry calf starter were fed free choice to all calves throughout the experiment. The consumption of each was tabulated. The dry calf starter was of the following formula (in pounds): Ground corn, 70, ground oats, 60; dried skimmilk, 20; soybean oil meal, 42; wheat bran, 4; salt, 2; bonemeal, 2; and aurofax 10.5.

The milk replacer used in this study consisted mainly of dried milk products with small amounts of animal fat, vitamins, minerals, and antibiotics. The chemical analysis showed: Crude protein, 21.00%; crude fat, 8.50%; crude fiber, 0.50% and ash, 9.00%. The milk replacer was reconstituted with water and fed at a temperature of about 90°F .

The whole milk used in this experiment was taken out of the bulk milk tank cooler and warmed to 90°F before being fed to calves. The average butterfat content of the milk was 4 per cent.

All calves were raised in individual pens, either in a conventional closed barn or in an open calf-shed.

RESULTS AND DISCUSSION

Growth Performance. Average increases in body weight, height at withers, and heart girth are shown in Table 2.

TABLE 2

Average Gains in Weight, Height at Withers, and Heart Girth by Calves at 28 and 49 Days of Age

	Replacer				Whole Milk			
	Hol.	Jer.	Guern.	Av.	Hol.	Jer.	Guern.	Av.
No. of Calves	10	5	5		10	5	5	
Av. Birth Wt (lb.)	86.8	50.2	62.2	66.4	87.7	49.3	67	68
Av. Daily Gain (lb.)								
3 to 28 days	.59	.54	.47	.53	.86	.59	.74	.73
28 to 49 days	1.77	1.10	1.16	1.34	1.50	1.25	1.49	1.41
3 to 49 days	1.09	.78	.77	.88	1.13	.87	1.06	1.02
Av. Withers Height Gain (in.)								
3 to 28 days	1.32	1.69	1.13	1.38	1.25	1.38	1.30	1.31
28 to 49 days	.85	1.06	1.18	1.03	1.48	1.52	1.40	1.47
3 to 49 days	2.17	2.75	2.31	2.41	2.73	2.90	2.70	2.78
Av. Heart Girth Gain (in.)								
3 to 28 days	2.10	1.38	1.88	1.79	2.89	3.00	2.60	2.83
28 to 49 days	2.63	2.50	3.00	2.71	3.17	3.00	2.75	2.97
3 to 49 days	4.73	3.88	4.88	4.50	6.06	6.00	5.35	5.80

Although an analysis of variance indicated no significant difference ($P > 0.05$) in weight gains between calves fed replacer and whole milk there was consistently higher gain for whole milk-fed calves. As can be depicted in Table 2 the greatest difference between replacer and whole milk fed calves was between 3 and 28 days of age. Calves gained best on whole milk the first 28 days, however, between 28 and 49 days the calves did about as well on replacer. In fact, the Holstein calves gained more on replacer between 28 and 49 days. This data indicated that to get the best growth performance it would be best to feed whole milk the first few weeks and then switch to feeding milk replacer. However it should be brought out that both replacer and whole milk-fed calves were strong and healthy and produced satisfactory gains for herd replacements.

No significant differences ($P > 0.05$) in height at withers or gain in heart girth were attributable to either milk replacer or whole milk fed calves. However, as with weight gains, the whole milk-fed calves gained slightly better than the replacer fed calves. All calves grew normally.

Feed Consumption and Feed Cost. Table 3 shows the amount of feed consumed during the 49 day test period. The main significance in this table is the greater calf starter consumption by replacer-fed calves. Perhaps an explanation for this is that milk replacer-fed calves consumed less milk solids than whole milk fed calves. Hay consumption was not affected in either group.

TABLE 3

Average Feed Consumption by Calves at 49 Days of Age

	Replacer				Whole Milk			
	Hol.	Jer.	Guern.	Av.	Hol.	Jer.	Guern.	Av.
No. of Calves	10	5	5		10	5	5	
Whole Milk (lb.)					297.9	238.7	280.1	272.2
Milk Rep. (lb.)	32.7	26.2	26.3	28.1				
Calf Starter (lb.)	71.9	53.8	52.4	59.4	53.7	36.3	49.9	45.6
Hay (lb)	12.3	4.0	5.3	7.2	10.7	4.1	4.8	6.5

A comparison of feed cost between replacer and whole milk-fed calves is given in Table 4. The feed cost per pound of gain was six cents less for replacer fed calves. This was figured on the basis that milk replacer cost $18/100 lb; calf starter $3/100 lbs.; hay $1.25/100 lb., and whole milk $3.50/100 lb. Had the whole milk been priced at $4.00 per hundred, which is still under the price often received for Grade A milk, the feed cost per pound of gain would have been 25 cents. Even if the whole milk price had dropped to $3.00 per hundred it would still cost 4 cents less per pound of gain to feed milk replacer.

TABLE IV

Average Feed Consumption by Calves at 49 Days of Age

	Replacer				Whole Milk			
	Hol.	Jer.	Guern.	Aver.	Hol.	Jer.	Guern.	Aver.
No. of Calves	10	5	5		10	5	5	
Whole Milk					$10.43	$8.35	$ 9.80	$ 9.53
Milk Rep.	$5.71	$4.72	$4.73	$5.06				
Calf Starter	$2.16	$1.61	$1.57	$1.78	$ 1.61	$1.09	$ 1.41	$ 1.37
Hay	$ .15	$ .05	$ .07	$ .09	$ .13	$ .05	$ .06	$ .08
Total Cost	$8.02	$6.38	$6.37	$6.93	$12.17	$9.43	$11.27	$10.98
Feed Cost per Pound Gain	$ .15	$ .17	$ .17	$ .16	$ .22	$ .22	$ .22	$ .22

In addition to the cheaper cost of feeding milk replacer, another advantage appears to be in the lower incidence and severity of scours. As shown in Table 5. only 3 calves had scours in the replacer-fed group whereas 12 had scours in the whole-milk-fed group. Also the severity was greater for whole milk-fed calves as indicated by the days of scouring. All scouring occurred within the first 3 weeks of age of the calf. Most calves showed no signs of scouring in either group. The number of cases of scouring shown on Table 5 appears to be high due to the fact that some calves had as many as 3 separate cases of scours. These data would indicate that the antibiotics (i.e. chlortetracycline) in the milk replacer had reduced the problem of scours under our system of management.

TABLE 5

Occurrence of Scouring in Calves During 49-Day Test Period

	Replacer				Whole Milk			
	Hol.	Jer.	Guern.	Total	Hol.	Jer.	Guern.	Total
No. of Calves	10	5	5	20	10	5	5	20
Cases of Scouring	3	0	0	3	8	3	1	12
Days of Socouring	3	0	0	3	9	5	3	17

SUMMARY

Forty Holstein, Jersey and Guernsey calves were used to compare the performance and economic gains of calves fed milk replacer with calves fed limited whole milk. Milk replacer and whole milk were fed according to recommended standards.

Although normal growth was sustained by both milk replacer and whole milk-fed calves weight gains were consistently higher in all three breeds for calves fed whole milk. Likewise the gain in wither height and heart girth were also greater for whole milk fed calves.

Even though growth performance appears to be greater in calves fed whole milk, the replacer-fed calves produced the cheapest cost per pound of gain. Also the incidence and severity of scours were decreased by feeding milk replacer.

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