

REARING ONCE-DAILY FED CALVES USING DIFFERING MILK FAT PERCENTAGES, FEEDING METHODS AND WEANING AGES

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Summary

Friesian calves were used in three experiments examining once-daily feeding techniques under extensive management conditions.

Although a significantly higher live-weight was obtained from using milk containing 3 per cent fat, it was concluded that calves could be reared satisfactorily on milk containing between 3 per cent and 5 per cent butterfat.

No advantage was recorded in using teats for once-daily feeding compared with buckets. Once-daily fed calves were weaned onto a high energy concentrate as young as four weeks with a slight retardation in growth, but without significantly reducing live-weight at twelve weeks.

I. INTRODUCTION

Once-daily bucket feeding of a milk replacer is satisfactory for rearing dairy calves, and offers significant labour savings compared with twice-daily feeding (White and Radcliffe 1970).

This paper reports three investigations aimed at extending the use of once-daily calf feeding techniques. To examine the use of whole milk for once-daily feeding, 'a trial was carried out using isocaloric milk rations at three levels of butterfat. The use of teats has shown no consistent advantage over buckets in twice daily feeding (Alexander 1954; Kesler, McCarthy, and Knodt 1956; Wise and LaMaster 1968). However, a second experiment investigated the possibility of teats proving an advantage in once-daily feeding. Calves fed whole milk twice daily can be weaned on to high energy rations from three weeks of age (Preston 1956; Stobo, Roy and Gaston 1967; Jorgenson *et al.* 1970). Calves housed individually in indoor pens can be fed milk replacer once-daily and weaned at six weeks of age (Willett, Albright, and Cunningham 1969). A third experiment was designed to determine at what age calves could be weaned from once-daily milk replacer feeding when held out-doors in groups.

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II. MATERIALS AND METHODS

(a) General Management

Friesian male calves purchased under one week of age were brought to the Northfield Research Centre, stratified into replications on the basis of liveweight, and randomly assigned to treatments within replications.

All liquid feeds were given at 39°C once-daily, at a regular time. Lucerne hay and water were available *ad lib.* throughout each experiment. The calves were housed in portable corrugated iron sheds 3.6 x 2.1 m with the open northern face attached to a yard 4.6 x 3.0 m. These were shifted to fresh sites every four weeks. Each yard was provided with a hay rack, two 3-unit calf feeding bails and an automatic water bowl.

Animals were inspected for health status only at feeding times. When scouring was observed, the affected calf was isolated and all feed and water withheld for 24 h. Half the normal milk or milk replacer ration was then given until the faeces became normal when full ration was resumed.

The calves were weighed weekly and the data examined by analysis of covariance.

(b) Experiment 1; varying milk fat percentages

Thirty-six calves purchased on October 27, 1970 were assigned to nine factorially arranged feeding treatments consisting of three energy intake levels, each given with 3 per cent, 4 per cent or 5 per cent butterfat milk. Each replicate was housed in a separate shed.

The three energy intake levels were progressively increased from 5.8, 7.3 and 8.9 to 8.8, 10.9 and 13.0 MJ/day respectively over the first three weeks, and remained at that level until the calves were weaned at twelve weeks. The volumes of milk required for each treatment were calculated from the formula of Gaines and Overman (1938).

Fat percentages of bulk milk and cream were determined daily using a "Milkotester Mark II"*. Milks with fat percentages higher than in the bulk milk were prepared by adding cream. Since cream diluted the solids-not-fat, a similar dilution was made of the remaining milk by adding an equivalent amount of water. Bulk milk was then adjusted to the lower fat level by adding skim milk.

Crushed oats at the rate of 227 g/calf/day was offered after the fourth week.

(c) Experiment 2; bucket versus teat feeding

Thirty-two calves purchased on April 8, 1970 were assigned to eight replicates each containing four feeding treatments — (1) bucket-fed whole milk, (2) teat-fed whole milk, (3) bucket-fed milk replacer and (4) teat-fed milk replacer. Each replicate was housed in a separate shed.

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The gross energy of the milk replacer? was determined in an adiabatic bomb calorimeter. The calves were fed equal volumes of isocaloric milk or milk replacer (15 per cent suspension) once daily. They were given 2.3 l daily in the first week, 2.8 l in the second week and then 3.4 l until weaning at 10 weeks. Crushed oats was fed at the same rate as in the previous experiment. All buckets were placed at ground level, and teats‡ were located 45 cm above the ground. Teat orifices were 0.3 cm in diameter.

(d) Experiment 3; weaning age

Forty-eight calves purchased on October 6, 1970 were divided into three replicates each containing four treatment groups. Each treatment group was housed in a separate shed. To eliminate shed effects, groups were moved randomly between sheds within replications three times weekly.

Calves were bucket fed a milk replacer once-daily as in the previous experiment. The four treatments consisted of abruptly weaning at (1) 4 weeks, (2) 6 weeks, (3) 8 weeks and (4) 12 weeks. A concentrate was offered *ad lib.* to calves in the first three treatments one week prior to weaning. The concentrate, which was a modification of the formula of Naylor and Leibholz (1970), consisted of whole barley 92 per cent, urea 2.1 per cent, dried molasses supplement** 5 per cent, sodium chloride 0.5 per cent and sodium sulphate 0.4 per cent, and was pelleted through a 4.8 mm diameter die. The concentrate had a mean crude protein composition of 23.8 per cent.

From twelve weeks all calves were held as one group, and fed hay and silage until weighed at seven months of age.

III. RESULTS AND DISCUSSION

(a) Experiment 1; varying milk fat percentages

The mean liveweights at 12 weeks, covariance corrected to the initial liveweights, are given in Table 1. Independent of the energy level, calves fed milk

TABLE 1

Mean corrected liveweights at twelve weeks for calves fed milk once-daily

Butterfat in milk (%)	Mean daily intakes of energy (MJ)		
	8.3	10.3	12.3
	Live-weight (kg)	Live-weight (kg)	Live-weight (kg)
3	87.9	93.8	95.9
4	83.3	82.6	88.2
5	78.5	83.2	84.3

L.S.D. for live-weight ($P < 0.05$) = 4.8 kg.

†“Denkavit”, manufactured by Hall Sandford and Co., Mitcham, South Australia, for Denkavit, (Australia) Pty. Ltd., Melbourne, Victoria.

‡“Calfeteria minor”, manufactured by New Zealand Pasture Implements Pty. Ltd.

**“Promin”, Victorian Wheatgrowers Ltd., 17 Queen Street, Melbourne, Victoria

containing 3 per cent fat had significantly ($P < 0.05$) higher liveweight gains at weeks 5, 6, 8, 9, 10, 11 and 12 than calves fed milk containing 4 per cent or 5 per cent fat. Higher energy intakes resulted in significant ($P < 0.05$) liveweight increases at weeks 9, 10 and 12.

The scouring incidence in the treatments ranged between 0.3 and 1 scouring days per calf. No calves died.

There is a widespread belief that overfeeding of calves with whole milk diets results in scouring (Radostits and Bell 1970). However, where the lowest fat milk was fed in the highest volumes, there was a significantly higher liveweight gain within each energy level and no persistent scouring. The low fat milk was more efficiently used by the calf so that dilution of high fat milk with skim milk, as recommended by Roy (1970), appears advantageous. However, where high fat milk is available for calf feeding, the labour cost in diluting with skim milk may not warrant the small increment in gain.

(b) Experiment 2; bucket versus teat feeding

Bucket-fed calves were significantly heavier ($P < 0.01$) than teat-fed calves only in the first week, when the respective mean liveweights, covariance corrected to the initial liveweights were 45.2 and 43.4 kg. Calves fed milk replacer were significantly heavier ($P < 0.05$) than those fed milk only in the ninth week. The mean covariance corrected liveweights at the end of the trial for treatments 1, 2, 3 and 4 were 76.3, 73.0, 81.3 and 77.8 kg respectively and were not significantly different. The total scouring incidence in each treatment was 4, 5, 9 and 5 animal scouring days respectively. No calves died.

It is evident from the results that there are no differences in calf growth rates between the rearing methods with once-daily feeding. The labour required to teach purchased calves to drink from buckets or teats was similar, but a 20 per cent increase in labour time was required for teat feeding, principally due to the extra preparation and washing required.

(c) Experiment 3; weaning age

The mean liveweights, covariance corrected to the third week when the first concentrate feeding began, are given in Table 2. Mean feed intakes for the first twelve weeks are also given. The calves weaned at four weeks had a significantly ($P < 0.05$) lower liveweight than the calves in the 6- and 12-week weaning treatments at weeks 6, 7 and 8. However, at 12 and 28 weeks, there were no significant differences ($P < 0.05$) between the treatments.

Thirteen animal scouring days and three deaths were recorded before weaning. Two calves died from scouring and one from bloat. One animal was removed because of a broken leg.

Although early weaning can be combined with once-daily feeding when using extensive management conditions, abrupt weaning at four weeks of age produced a significant decrease in growth rate during the following month. The total concentrate intake by the calves weaned at four weeks was similar to that of the calves weaned two weeks later (Table 2), even though milk replacer feeding

TABLE 2

Mean corrected liveweights and mean feed intakes of calves weaned at different ages

	Weaning age (weeks)			
	4	6	8	12
Live-weight (kg)				
12 weeks	82	89	83	85
28 weeks	131	140	138	141
Food intake at 12 weeks (kg DM)				
Milk replacer	12	19	26	40
Hay	37	41	55	95
Concentrates	83	80	50	0

had been terminated. After week 8, the calves weaned at four weeks continued to have lower liveweights, but differences were not significant due to greater within treatment variability.

Weaning calves at four weeks more than halved the feeding labour requirement compared with weaning calves at twelve weeks.

IV. CONCLUSIONS

Under extensive conditions, once-daily fed calves can be satisfactorily reared under a wide range of nutritional conditions. However, when calves are weaned at four weeks on to a high energy concentrate, a temporary retardation in growth can be expected. The combination of rearing methods which would be labour saving and produce optimum calf growth rates is once-daily bucket feeding of milk replacer or 3 per cent fat milk, followed by abrupt weaning at 6 weeks on to a high energy concentrate ration.

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