Growth of Friesian calves offered three allowances of milk replacer

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ABSTRACT

Milk and milk products are a more expensive source of dietary nutrients than pasture and cereal based supplements. Therefore restricting milk intake could reduce the cost of rearing replacement cattle.

Friesian calves (n=60) were allocated to three balanced treatment groups receiving a High (29.8 kg), Medium (21.8 kg) or Low (16.6 kg) allowance of milk replacer (MR). Calves offered the Low allowance were weaned from MR at day 42, while the other two groups were weaned from MR at day 49 of the trial. Calves were weighed at days 0, 49, 70 and 119 following a 12 hour fast.

The liveweight gain of the High group was greater ($P<0.05$) during days 0-49 and 49-119 than the Medium and Low groups. The calves on the Medium and Low MR allowance were 3 kg lighter on day 49 and 7 kg lighter on day 119 than those of the High MR allowance. Differences in growth rates between treatment groups prior to day 49 were smaller than would be expected from the large difference in metabolisable energy intake from MR. Furthermore, reducing MR allowance did not increase meal intake as was expected. It is likely that the calves partially compensated for a lower MR intake by increasing pasture dry matter intake.

When choosing to restrict the level of nutrition offered to the young calf, the effect on animal performance both before and after weaning must be recognised.

Keywords: Milk replacer; Friesian calves; Liveweight gain.

INTRODUCTION

Rearing replacement calves of dairy origin is a major cost to both the dairy and bull beef industries and represents a significant proportion of the total cost of production. The importance of adequate rearing was emphasised by Everitt and Jury (1977) who demonstrated that the pre-weaning growth of calves affected their subsequent mature body size. Therefore, the aim of successful calf rearing must be to provide a level of nutrition that will enable optimum growth rates at the lowest possible cost. Milk replacers (MR) are often used due to the high cost or the unavailability of whole milk, and a cereal based starter meal in the diet is often used to encourage rumen development (Schouten 1995). Because of the high value of milk products relative to cereal grains, meal may also be used to reduce the quantity of milk required. Restricting the energy intake from milk or milk replacer will generally increase meal intake, therefore encourage ruminal development, and reduce the total cost of feed required (Dawson, 1980). While this strategy is likely to enhance the transition from liquid to non-liquid feeds at weaning, it may also compromise pre-weaning growth rates (Davey, 1974).

This paper reports the effects of severe restrictions in milk replacer allowance during rearing, on the growth of calves.

MATERIALS AND METHODS.

Friesian calves (n=60), comprising males and females, were collected from the DRC herd during 3 weeks in July 1995. Until the trial commenced the calves were offered 4l/day milk replacer with no access to starter meal. On the first day of the trial the calves were 16 days of age with an average 12 hour fasted liveweight of 36.8 kg. Twenty calves were allocated to each of the three treatment groups, balanced for sex, fasted liveweight, Immunoglobulin levels, and age. The three treatments were a High (29.8 kg), Medium (21.8 kg) and Low (16.6 kg) MR allowance. Calves offered the Low allowance were weaned from MR at day 42, while the two other groups were weaned at day 49 of the trial.

Management

Milk replacer containing 22.3% fat and 26.4% protein (as measured by Rose Gottlieb and Kjelfoss & Tecator methods) and of good curd formation characteristics (Rennet test) was mixed at the rate of 125g powder/l of water, at 40°C. Groups were offered half the daily allocation of MR twice each day from day 0 to day 14 and the total MR allocation once a day from day 15 until weaning. Up to weaning all calves had *ad-lib* access to a standard calf meal and hay.

The calves were kept in a barn for a period of 1-2 weeks from the start of the trial, and were subsequently grazed on pasture. Until day 70, the three groups were grazed separately at a common herbage allowance (42 kg DM/calf) and were moved on to fresh pasture as required. The meal was offered in troughs while indoors and via covered meal dispensers once outdoors and hay was offered in the barn and in dispensers outdoors.

Between weaning and day 70, all calves were offered 1.5 kg/day of a standard calf meal, hay *ad libitum* and fresh leafy pasture. From day 70 to day 119 all calves were grouped together and offered an allowance of 29 kg DM/calf of fresh pasture with no access to meal.

Worming, vaccination, dehorning and treatment for scours were according to routine procedures under the guidance of a Veterinarian.

Measurements.

Liveweight was measured on days 0, 49, 70 and 119 following a 12 hour fast from feed but not water. Refusals of meal and hay at the end of each week were recorded and deducted from that offered to calculate the weekly meal and hay intake of each group. The occurrence and severity of animal health problems were recorded for individual animals.

Statistical analysis.

Treatment effects on the liveweight gain of the calves were assessed by analysis of covariance using the liveweight on day 0 as the covariate.

RESULTS

The high group was heavier ($P<0.05$) than the low group at days 49, 70, and 119, and the medium group at day 49 and 119 (Table 1). There was no difference between the liveweights of the medium and low treatment groups at days 49, 70 or 119. Despite differences in the feeding treatments ending at day 49, calves offered the high MR allowance gained more liveweight from days 70 to 119 than the calves offered the medium MR allowance (Table 2). Therefore, the difference in favour of the high treatment was greater at day 119 than at 70 or 49 days.

There was little difference in the meal intake between the groups. The meal intake of the High, medium and Low MR groups was 602, 529 and 621 g DM/calf/day from days 0-49. Hay intake was small (100-120 g DM/calf/day) and varied little between groups.

TABLE 1: Mean values for fasted liveweight (kg) for the three treatments at days 49, 70 and 119 with the SED.

Milk replacer allowance	High	Medium	Low	SED
Day 49	69.8[a]	66.2[b]	66.3[b]	1.6
Day 70	83.4[a]	79.9[ab]	78.7[b]	2.1
Day 119	108.2[a]	100.9[b]	101.2[b]	3.0

means in the same row with differing superscript letters are significantly different($P<0.05$)

TABLE 2: Mean value for liveweight gain (kg/day) for the three treatments between days 0-49, 49-70, 70-119, and for the whole post milk replacer period (49-119), with the SED

Milk replacer allowance	High	Medium	Low	SED
Day 0 to 49	0.660[a]	0.588[b]	0.591[b]	0.032
Day 49 to 70	0.684[a]	0.685[a]	0.617[a]	0.046
Day 70 to 119	0.505[a]	0.429[b]	0.459[ab]	0.035
Day 49 to 119	0.557[a]	0.503[a]	0.501[a]	0.029

means in the same row with differing superscript letters are significantly different($P<0.05$)

From day 0 to 49 the High MR group grew at a faster rate than the other two groups ($P<0.05$) (Table 2). The High MR group also had a slightly faster growth rate between days 49 and 119 although the differences were not significant and were not consistent over the periods 49 to 70 and 70 to 119 days (Table 2).

Few animal health problems were experienced with 0, 7 and 4 of calves treated in the High, Medium and Low groups respectively. The Medium and Low groups had respectively, 2 and 0 calves treated for scours and 2 and 1 for diphtheria. The remainder were treated for minor skin or external infections

DISCUSSION

The average daily liveweight gain of the High, Medium and Low milk replacer allowance was 667, 616 and 598 g/day respectively, during the first 70 days of the experiment. These growth rates are insufficient to attain the target liveweight of 90 kg at 70 days of age recommended by Penno (1994). At day 70 of the trial (86 days of age) the average fasted liveweight of the High group was only 83.4 kg. This suggests that even the high allowance of MR (0.6 kg/calf/day plus *ad-lib* meal) was too low, and that the Medium and Low levels of MR were too low. However, the high fat density of the milk replacer used in the trial (22.3% fat) may have also reduced animal performance. Reduced feed intake and growth rates occurred in calves reared using 21.6% fat MR compared with calves reared using 15.6% fat MR (Kuehn et al., 1994).

Despite the large difference in metabolisable energy intake between the High, Medium and Low milk replacer allowances from the MR offered (581, 426 and 324 MJME), the differences in liveweight gain were relatively small. Offering the Low and Medium groups 13.2 and 8.0 kg/calf less milk replacer respectively than the High group resulted in calves which were 3.6 and 3.5 kg lighter at day 49. Davey (1974) suggested that calves will compensate for lower milk energy intake by increasing meal consumption at an early age, however this was not apparent in this trial. Energy balance calculations (Holmes & Wilson, 1987), considering known feed intake and growth rates, suggest that the High, Medium and Low groups consumed 86, 247 and 342 g DM as pasture /day from day 0 to 70. Using these calculations up to day 49 the medium and low calves would have been 5.2 and 2.9 kg lighter at day 49 if they had not had access to pasture, or would have eaten more meal.

The growth rate of the groups in the post-weaning period were similar, resulting in the pre-weaning differences in liveweight being maintained. This suggests that there was no compensatory growth during this period and that any effect on liveweight incurred at an early stage will have prolonged effects on subsequent liveweight. This agrees with Everitt and Jury (1977) who demonstrated that restrictions in pre-weaning nutrition can affect the lifetime performance of cattle

CONCLUSIONS.

These results demonstrate that there is potential to reduce the cost of calves rearing by restricting milk intake. Calves will partially compensate for reduced energy intake from milk by eating other feeds. When milk intake is restricted calves should be offered fresh clean pasture as early as possible as a cheap alternative source of dietary energy.

When choosing to restrict the level of nutrition offered to the young calf, the effects on animal performance both before and after weaning must be recognised

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