THE EFFECT OF LEVEL OF MEAL ALLOWANCE ON THE GROWTH OF EARLY-WEANED CALVES AT PASTURE

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SUMMARY

Nine groups, each of six 6-week-old Jersey and Jersey-cross calves, were rotationally grazed on white clover-dominant pasture. A pelleted meal (20% crude protein) was offered *ad libitum* to one group, and at 85, 75, 61, 49, 37, 25, 13, and 0% of that level to the remaining groups. Mean daily liveweight gains over the 5-week meal-feeding period ranged from 700 g/day for the *ad libitum* group down to 460 g/day for the group not receiving meal. Liveweight gain increased by 19 g for every 100 g increase in meal eaten ($r = 0.94$). During a 4-week follow-up period, when all calves grazed pasture as one mob without meal supplementation, growth rates were negatively related to increasing meal allowance in the previous treatment period and negated the liveweight advantage resulting from meal supplementation.

INTRODUCTION

Calves can be weaned on to pasture at an early age, but generally respond to supplements of concentrates (Gleeson, 1971; Byford, 1973). However, meal supplementation is more costly than grazing alone. Therefore, to be able to make optimum use of meal, it is important to know both the immediate and longer-term effects of supplementing young calves with meal at pasture. The results here are from a preliminary investigation into the effects of range of meal supplementation rates on the growth of the early-weaned calf at pasture.

EXPERIMENTAL

Fifty-four 36- to 46-day-old Jersey and Jersey × Friesian calves were divided into three groups of 9 male calves and three groups of 9 female calves according to liveweight and breed; within these groups calves were randomly allocated to 9 treatments. These were: pasture only (Group 1) and pasture plus a pelleted meal ("Weenemon", N.Z. Stockfoods Ltd) for five weeks at 12½, 25, 37½, 50, 62½, 75, 87½, and 100% *of ad libitum* meal intake for Groups 2 to 9, respectively.

Calves in each group obtained their meal from a common trough and the treatment groups were rotationally grazed. At commencement of the experiment the pasture contained 52% clover, 41% grass (mainly ryegrass and *Poa* species) and 7% weeds. The paddocks were subjectively estimated to contain, on average, 2000 kg DM/ha prior to grazing and to ensure that herbage intake was not limited by herbage allowance all groups of calves were shifted to spelled paddocks when approximately 15% of the total dry matter had been utilized by any one treatment group. These shifts occurred every 2 to 3 days.

At the end of the 5-week experimental period, three calves from each treatment were slaughtered without fasting and the weight of the contents of the digestive tract recorded. The other three calves from each treatment were grouped into one mob and offered pasture only for the next 38 weeks; during this time they were weighed monthly.

RESULTS

As intended, meal intake increased from Groups 1 to 9; differences between successive groups were about 200 g/head/day. Mean daily intake of meal, on a weekly basis, for the group offered meal *ad libitum* was 1006, 1520, 1730, 2035, 1843 g/calf for weeks 1 to 5, respectively.

Treatment had a highly significant effect on daily gain. The following equation defined the between-group relationship between liveweight gain (g/day, Y_1) and meal intake (g/day, X):

$$Y_1 = 0.19\ (\pm\ 0.02)\ X + 447;\ n = 9;\ r = 0.94;\ \text{RCV} = 6\%$$

The regression coefficient shows daily gain to have increased by 19 g for every 100 g increase in meal intake.

Although there were significant increases in the weight of digesta in the alimentary tract associated with increasing meal allowance, this was also associated with increasing liveweight, and the ratio of digesta-free liveweight to final liveweight was not affected by treatment.

Growth rates in the first four weeks of the follow-up period (Y_2), when all the surviving calves grazed together without supplements, were negatively related to previous meal intake as defined by the following equation:

$$Y_2 = 837 - 0.19\ (\pm\ 0.04)X;\ n = 9;\ r = 0.90;\ \text{RCV} = 12\%$$

TABLE 1: MEAL INTAKE, LIVEWEIGHT GAINS AND SLAUGHTER RESULTS

Treatment (Meal Intake as % of ad libitum *Group's Intake)*	*0*	*13*	*25*	*37*	*49*	*61*	*75*	*85*	*ad lib.*	*Within-group SD*	*Regression Coefficients of Group Means on % Meal (± SE)*	
Group meal intake (g/ha/day)[1]	0	212	408	604	803	1000	1220	1382	1627	—	—	—
Daily LWG 6-11 wk (g, $n = 6$)[2]	460	470	500	550	610	660	660	770	690	80	3.0 ± 0.3	***
Digesta-free LW (kg, $n = 3$)[2]	46.7	50.5	49.7	49.0	52.2	51.5	52.0	56.4	53.0	2.1	0.067 ± 0.013	***
GIT[3] digesta Wt. (kg, $n = 3$)[2]	6.17	6.13	6.53	6.15	6.78	7.90	6.86	7.40	8.02	1.28	0.018 ± 0.004	***
Digesta-free LW/Final LW 10[2] ($n = 3$)	79.2	81.0	81.1	81.7	80.6	79.7	81.0	81.3	79.6	2.0	0	NS
Daily LWG 12-15 wk (g, $n = 3$)	870	780	740	700	730	570	680	500	550	140	— 3.2 ± 0.6	***

[1] Meal contained 20% protein and 15% acid detergent fibre (dry basis).
[2] Adjusted for initial liveweight. Mean initial liveweight = 44.7 kg.
[3] GIT: gastro-intestinal tract.

There was no within-group relationship between liveweight at weaning from meal and subsequent gain. The sum of the effects of meal allowance on growth rates in the treatment and post-treatment periods was such that daily gains from 6 to 15 weeks of age were unaffected by treatment and averaged 640 g/day. Growth rates in the remainder of the follow-up period were unrelated to previous treatment.

DISCUSSION

There was a significant positive growth response to increased meal supplementation in this experiment and the growth rates of the zero meal (463 g/day) and the *ad libitum* meal (700 g/day) groups compare favourably with comparable treatments in studies by Gleeson (1971) (370 g and 680 g, respectively) and Byford (1973) (320 g and 580 g, respectively). In contrast, Castle and Walker (1959), in a grazing study with calves initially 8 weeks of age, did not record increased growth with concentrate supplementation.

One of the objectives of this study was to see if the response of weight gain to meal intake diminished at the higher meal allowances. Despite the lower gains of the *ad libitum* compared with the 85% group, curvilinearity was not observed in the analysis of the relationship between gain and meal intake. The response of 19 g weight gain per 100 g meal intake is higher than recorded in studies with older cattle (Forbes *et al.*, 1967; Tayler and Wilkinson, 1972; Hodgson and Tayler, 1972). Several factors may have contributed to this. If pasture allowance limited intake in the present experiment a high response to meal would be expected. However, calves were shifted when the most restricted group visually utilized about 15% of herbage available and, since daily gain of calves offered pasture only compare favourably with growth rates in controlled studies employing similar treatments (Gleeson, 1971; Byford, 1973), it is suggested that pasture allowance probably did not limit intake. The capacity of the young calf to eat considerably more dry matter as concentrate-meal than as pasture (Byford, 1973) probably contributed significantly to the nature of this relationship, with calves at the lower meal allowances probably eating more pasture than calves at the higher meal allowances, but not consuming as much total dry matter as the latter.

The response of 19 g weight gain per 100 g meal fed in the treatment period reversed in the post-treatment period to one of minus 19 g gain per 100 g meal previously fed. This resulted

from animals previously fed lower meal allowances exhibiting compensatory growth while others at the higher meal allowances showed negative compensation. These results contrast with recent compensatory growth studies using identical twin cattle (Everitt, 1972; Reardon and Everitt, 1972) but are in agreement with most earlier New Zealand dairy cattle experiments (*cf.* Reardon and Everitt, 1972) showing compensation after restricted feeding.

In conclusion, this experiment confirms that early-weaned calves will consume more feed and grow faster when offered meal and pasture than when offered pasture alone. However, the benefits from feeding meal might be subsequently lost where high-quality pasture is readily available. The relationships between growth and pasture and meal allowance require further investigation, especially with respect to age at weaning from meal and rate of withdrawal of meal.

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