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Effect of offering two levels of crude protein and two levels of milk replacer on calf performance

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Introduction

Recent reports from the United States propose new nutritional guidelines for calves (VanAmburgh 2003). They suggest an accelerated growth programme where calves are offered a high protein milk replacer (CMR) at a level sufficient to achieve a liveweight gain of 1000 g/d up to 8 weeks of age. This is in contrast to many European feeding programmes where calves are offered 25 kg of CMR over 42 days with an expected liveweight gain of 500 to 600 g/day. The objective of this experiment was to evaluate the accelerated growth system under Irish conditions.

Materials and Methods

In experiment 1, sixty-four 2 to 3 week-old Holstein/Friesian calves with an initial weight of 50 kg (+/- 1.8) were allocated immediately following purchase to the following treatments: (1) 23% crude protein CMR at 600 g/d (LL), (2) 23% crude protein CMR at 1200 g/d (LH), (3) 30% crude protein CMR at 600 g/d (HL) and (4) 30% crude protein CMR at 1200 g/d (HH). The milk replacer was offered warm by bucket with the daily allowance reduced to encourage solid food intake in the period 42 to 56 days. All calves had *ad libitum* access to a concentrate diet throughout the 16-week experimental period. In the initial 56-day period all calves were individually penned on straw with a pen area of 1.5 m^2 per calf. Thereafter groups were penned according to treatment on concrete slats. In Experiment 2 thirty-six 2 week old Holstein/Friesian calves with an initial weight of 45 kg (+/- 1.6) were allocated on purchase to the following treatments: (1) 23% crude protein CMR at 750 g/d (LM) and (2) 30% crude protein CMR at 1200 g/d (HM). Feeding and management of the animals was similar to Experiment 1 for the first 112 days of the experiment. Thereafter all calves had *ad libitum* access to a 16% crude protein concentrate ration. The calves were accommodated according to treatment in four pen on concrete slats and had free access to water from a self filling drinker. Grass silage was offered daily as a roughage source (approximately 10% of total dry matter intake). The animals were slaughtered after 388 days on experiment. In Experiment 1 the data was subjected to a two-way analysis of variance. In Experiment 2 data was subjected to analysis of variance.

Results

Experiment 1. The higher level of crude protein in the milk replacer (23 v 30%) did not affect feed intake or liveweight gain. The level of feeding significantly decreased concentrate intake in the period 1 to 56 days and increased liveweight gain in the period 1 to 56 days, however the high level of milk replacer did not significantly affect liveweight gain in the period in the period 1 to 112 days (Table 1). In Experiment 2 the higher level

of milk replacer feeding significantly reduced concentrate intake in the period 1 to 56 days but had no significant effect on liveweight gain (Table 2). After 204 days the difference in daily liveweight was 6 kg between the two treatments and after 388 the difference was 12 kg. These differences were not significant in Experiment 2 and feeding additional milk replacer with a high protein in the first 56 day did not effect carcass weight, conformation or fat score. The killing-out percent was similar for both treatment groups (Table 2).

Table 1: Effect of level of feeding and level of protein in the CMR on calf performance (Experiment 1)

						Sig		
	LL	LH	HL	HH	Sem	L	P	L x P
Liveweight gain g/d								
1 - 56 days	690	760	720	870	48	*	-	-
57 - 112 days	1020	1140	1070	1110	67	-	-	-
1 - 112 days	860	950	900	990	48	-	-	-
Concentrate intake (kg/DM)								
1 - 56 days	34.0	28.2	41.1	23.2	4.12	**	-	-
57 - 112 days	180.5	189.6	168.2	211.9				
1 - 112 days	214.5	217.8	209.3	234.1				
CMR intake 1 - 56 days (kg/DM)	30.3	57.4	29.9	56.7				

Table 2: Effect of CMR programme on calf performance (Experiment 2)

	LM	HM	sem	Sig
Liveweight gain g/d				
1 - 56 days	550	640	45	-
57 - 112 days	1030	1070	85	-
1 - 112 days	790	860	55	-
1 – 204 days	1070	1100	23	
205 – 388 days	1060	1120	43	
1 – 388 days	1070	1110	33	
Final Carcass (kg)	457	475	12.9	-
Cold Carcass (kg)	230.5	239.7	6.65	-
Conformation	3.82	3.88	0.04	-
Fat score	2.64	2.31	0.24	-
K O%	50.4	50.4	0.01	-
Concentrate intake (kg/DM)				
1 - 56 days	29.0	17.4	2.75	**
57 - 112days	150.8	150.1		
1 - 112 days	179.8	167.5		
CMR intake 1 - 56 days (kg/DM)	29.6	46.3		

Discussion

In this study there was no apparent response to increasing the level of crude protein in the calf milk replacer from 230 to 300 g/kg. This finding is supported by Wicks et al (2005, 2005a) who reported no response to increasing the level of crude protein in the milk replacer from 230 to 300 g/kg. The calves in their studies were home born calves fed either 5 or 10 litres of milk replacer/day via automatic teat feeders which regulated the daily allowance.

The liveweight gain achieved in Experiment 1 at the high level of feeding for purchased calves was in the order of 800 gms/day in the first 56 days while Wicks et al (2005,

2005a) reported that liveweight gains to the high level of feeding was in the order of 500 gms/day in the period 1 to 56 days of age.

The apparent lack of response to increasing the crude protein content of the calf milk replacer from 230 to 300 gms/day contrasts with Diaz et al (2001) data which suggests that to optimise protein deposition in calves fed milk protein based diets that the protein content of the diet would need to be approximately 280 g/kg DM. Van Amburgh and Drackley (2005) suggest that in order to meet the energy allowable protein requirements when calves are gaining in excess of 700 g/d then the protein content of the diet must be at least 260 to 280 g/kg DM. Similar protein levels were predicted by Davis and Drackley (1998). The lack of response to increasing the level of protein in Experiment 1 maybe associated with lower than expected liveweight gains. The lower than expected liveweight gains were also apparent in Wicks et al (2005, 2005a) studies. At issue is that under practical rearing conditions can large amounts of milk replacer be successfully offered to young calves in the first weeks of life to promote increased rates liveweight gain without having any negative impacts on calf health.

Conclusion

In conclusion, increasing the daily CMR allowances from 600 g to 1200 g increased LWG in the period 1 to 56 day and there was no response to increasing the level of crude protein from 23 to 30%.

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