NUTRITIONAL RIEQUIREMENTS AND PRODUCTIVITY OF SINGLE PREGNANT AND LACTATING COWS WITH TWIN OR SINGLE CALVES

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SUMMARY

In 1987 and 1988 single and twin bearing autumn calving Hereford and crossbred heifers were individually fed during the final two months of pregnancy and the first two months of lactation. The heifers, live weight 422 ± 7.2 kg and 525 ± 11.2 kg (mean ± s.e.) respectively were fed rations adjusted weekly according to blood ketone (BOH) levels. During pregnancy, cows carrying twins tended to have *a* higher energy requirement, in 1988 twin and single bearing cows consuming 91.3 and 80.9 MJ ME/cow/day respectively ($P<0.05$). In both years, cows rearing twins were fed 21% more energy post calving than cows rearing single calves, 1.11, 0.92 and 0.99 and 0.82 MJ ME/kg $LW^{0.75}$/day for 1987 and 1988 respectively ($P<0.05$).

Whilst calf growth rate in both years was significantly lower for the twin calves, their combined growth rates *were* no worse than the single calves in 1987 and in 1988 their combined growth rates were significantly greater than the single calves (1.03 and 0.72 kg/calf /day). In 1988 the combined weaning weight of 456.8 kg for those twin calves was significantly greater than 243.5 kg for the single calves.

Although there was no significant difference in milk production in 1987, in 1988 twin-rearing cows produced significantly more milk, 8.11 and 4.95 kg/cow/day respectively.

INTRODUCTION

Compared to other meat production systems the beef herd is relatively inefficient. In U.S.A. over 50% of the herd feed supply is required for maintenance of the breeding cow. Under normal conditions the beef cow produces only 50 to 70% of her body weight as marketable progeny *per* year (Gregory *et al.* 1988). Thus, increasing the cows reproductive rate, relative to maintenance, should increase beef herd efficiency.

This paper reports preliminary experiments on the relative energy requirements of twin and single rearing cows and related production responses. The approach has been based on the assumption that elevated BOH concentration in the blood may provide a quantitative assessment of energy deficits. This has been well documented in sheep (Russel 1977) and also appears to be the case in cattle (Russel and Wright 1983). This approach was necessary because of uncertainty as to which cows would bear twins.

MATERIALS AND METHOD

In 1987, 22 pregnant predominantly Hereford autumn calving heifers were selected from a group of 80 that were previously treated with pregnant mare serum gonadotrophin (PMSG). Nine cows pregnant to first service were treated as potential twin or multiple bearers. In 1988 embryo transfer and PMSG were used to produce twins and 21 predominantly crossbred heifers were selected, seven were initially diagnosed as having multiple pregnancies.

In both years commencing in January all animals were individually fed by means

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of electronic doors. In 1987 a ration of wheat plus lucerne cubes was fed, with respective dry matter (DM) content 88.0 and 88.0%, crude protein (CP) 11.3 and 16.6% and estimated metabolizable energy content (ME)(MJ/kg DM) 13.0 and 8.4%. In 1988 lucerne cubes of similar chemical content were used with triticale, CP of 11.9%, DM of 87.1% and ME of 13.2 MJ/kg DM. All animals were fed daily rations, initially calculated using metabolic live weight (MAFF 1976), and subsequently *were* adjusted weekly according to the concentration of blood ketones as measured by serum B hydroxybutyrate concentration (BOH). In 1987 the aim was to keep BOH between 0.4 and 0.7 mmol/l, while in 1988 a target of 0.6 mmol/l was chosen. Animals were randomly allocated to feed-lots and feeding doors, but after calving, twin rearing cows (T) *were* put into the same group to minimise cross suckling with single rearing cows (S). Milk production was measured using machine milking in 1987 and machine and the weigh-suckle-weigh technique in 1988. Means of results within years were compared using Student's t test.

RESULTS

Figures were calculated on a weekly basis with respect to the date of calving, so that comparisons could be made between animals at a similar stage of pregnancy or lactation. Results are presented in Table 1 and Fig. 1 for cows either bearing or rearing twin and single calves.

Table 1 Production variables of single and twin bearing cows before and after calving in two years

Production variables	1987 Single Mean	± s.e.	1987 Twin Mean	± s.e.	1988 Single Mean	± s.e.	1988 Twin Mean	± s.e.
Six weeks pre-calving								
No. of cows	16		4		11		8	
ILW	416.3	10.9	413.5	24.3	510	11.5	547	16.7
LWC	33.0	4.3	44.4	8.4	32.9	2.9	31.0	8.7
CLWC	-43.0	4.7	-50.0	6.3	-53.5a	2.3	-91.1b	4.0
MELW	0.66	0.02	0.76	0.06	0.74	0.02	0.79	0.03
MED	64.5	2.67	75.5	9.1	80.9a	1.47	91.3b	3.39
Six weeks post-calving								
No. of cows	14		3		11		6	
CBW	32.2	1.11	21.6	1.37	35.2	1.65	30.7	1.21
LWC	-7.0x	5.5	6.0y	3.5	-11.5	6.2	4.2	2.6
MELW	0.92a	0.02	1.11b	0.06	0.82a	0.03	0.99b	0.04
MED	82.3a	2.78	102.7b	8.88	85.2a	2.92	100.6b	4.2
MILK	5.09	0.51	4.81	0.97	4.95a	0.22	8.11b	0.64
CGR	0.74a	0.06	0.31b	0.02	0.72a	0.05	0.51b	0.07
CLW	60.6a	3.04	31.8b	2.4	64.3a	3.04	50.9b	2.19
WW					243.5	10.09	228.4	8.11

Within years, means in rows with different superscripts differ; a and b $P<0.05$, x and y $P<0.1$.

MED:	Intake (MJ ME/cow/d)	CBW:	Calf birthweight (kg)
ILW:	Initial live weight (kg)	MILK:	Milk production (kg/d)
LWC:	Liveweight change (kg)	CGR:	Calf growth rate (kg/d)
CLWC:	Calving liveweight change (kg)	CLW:	Calf live weight at 6 weeks (kg)
MELW:	Intake (MJ ME/kg/LW0.75/cow/d)	WW:	280 day weaning weight (kg)

Cow liveweight changes

These are shown in Table 1 and Fig. 1(a). Liveweight change pre-calving was similar in both years for both groups, the T cows in 1987 gaining slightly more. Post-calving, the T cows in 1987 gained significantly more weight than the S cows ($P<0.1$). In 1988 the weight loss of the T cows was only marginally greater. In both years calving weight loss was higher in the T groups, being highly significant in 1988 ($P<0.01$).

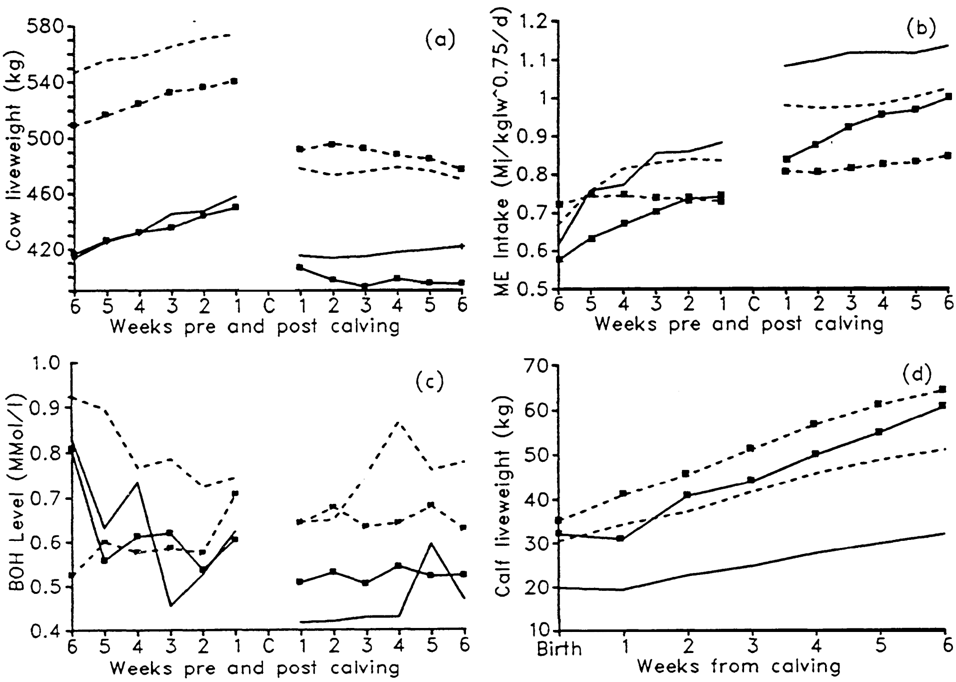

Fig. 1. Cow liveweight change (a), ME intake (b), BOH levels (c) and calf growth rate (d) in 1987 ________, and 1988------, for single■ and twin rearing cows.

Energy intake

Pre-calving ME intake tended to be higher for the T cows, but a significant difference was detected only in 1988 ($P<0.05$). Energy intake post-calving was 21% higher with the T cows in both years ($P<0.05$) - Fig. 1 (b).

BOH levels

Levels of BOH are shown in Fig. l(c). In 1987 BOH levels largely fell within the target range of 0.7 to 0.4 mmol/l. However in 1988 levels measured in the T-cows were higher in the period six weeks until two weeks prior to calving ($P<0.05$ weeks six and two). Just prior to calving BOH levels were similar in both groups. During week four of lactation in 1988 BOH levels of the T cows were also elevated ($P<0.05$).

Calf growth rate and milk production

In both years the single calves grew significantly faster than the twins, $P<0.05$, Fig. 1(d). However in 1987 there was no significant difference in total progeny live weight at six weeks, and in 1988 the twin cows produced significantly more live weight at six weeks ($P<0.01$). At weaning in 1988 there was no significant difference in live weight of the individual calves. In 1987 milk production of the two groups was similar. However in 1988 the twin group produced 63.8% more milk (8.11 v 4.95 kg/24 h, $P<0.01$).

DISCUSSION

The BOH levels responded quickly to changes in energy intake. In both years the pattern of cow liveweight change was similar for both groups. However after examining 1988 BOH levels, and the pre-calving liveweight change in relation to total calf birthweight, it seems that the T cows may have been energy deficient pre-calving, and should have received a higher allowance at that stage. Had feeding been increased to decrease BOH to levels similar to that of the S cows, the differences in ME intake between the two groups would have been greater, and would have resulted in greater liveweight changes pre calving for the twin-producing cows in 1988.

Although ME intake post-calving was significantly greater with the twin-rearing compared to the single rearing cows, the energy was partitioned differently in both years. In 1987 the extra energy consumed by the T cows seemed to be partitioned towards cow weight gain and not towards increased milk production Fig. 1 (a). The extra energy intake of the T cows in 1988 could be attributed to the extra milk production of that group. The extra 15 MJ ME/day is equivalent to 3.11 kg milk (1 kg milk = 4.94 MJ ME, MAFF 1976), and these cows produced 3.16 kg more milk than the singles. The cows in 1988 had a higher milking potential than those in 1987. The BOH concentrations of the T cows in 1988 were raised slightly in weeks three to six post-calving compared to those of the S group, This indicates that they should have had a higher energy intake for that period, which would have increased the extra energy required by these cows beyond the 21% shown in these figures, even though they lost less weight post-calving.

Even though the calf growth rates of the twins were significantly lower in both years, when total progeny live weight was examined, production from twin-rearing dams was favourable. When looking at the weaning weights of the calves in 1988, the twin calves compensated, so that by weaning there were no significant differences in live weight, resulting in twice the live weight produced by one dam.

In spite of the small number of twin rearing cows used, this study does indicate that providing adequate nutrition is *given* to the twin-rearing cows, (approximately 20% extra needed pre- and post-calving) and providing the dams chosen have a high milking potential (e.g. crossbred dams) twinning should result in increased efficiency of meat production.

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