

EFFECT OF VARYING PERIODS OF PRE-CALVING NUTRITION  
UPON THE CALVING PERFORMANCE OF HEREFORD HEIFERS

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Summary

Calving performance of 84 two-year-old Hereford heifers was studied following three regimes of pre-calving nutrition. The criterion for superior calving performance was minimal incidence of dystokia and stillbirth.

Treatments A (hay-fed for final 16 weeks of pregnancy) and B (hay-fed for final-8 weeks of pregnancy) involved once daily feeding of rye grass/clover hay at 5 kg per head until calving. This diet provided a sub-maintenance intake of both crude protein and energy. Treatment C heifers grazed a grass pasture throughout pregnancy until commencement of the calving period, when hay feeding at the 5 kg level was implemented. The three treatments calved under identical conditions.

There were no between treatment differences in pre-calving body condition and body weight changes of heifers, calf birth weights or calf body measurements. There was a significant correlation between calf birth weight and the incidence of either dystokia or stillbirth. When data were corrected for this birth weight correlation, the number of calves either involved in dystokia or stillbirth was significantly greater in Treatment A than Treatment B. There was also a significant correlation between calf birth weight and the incidence of dystokia alone.

It is inferred that illthrift factors associated with prolonged confinement and undernutrition were mainly responsible for this inferior calving performance by the longer-fed heifers. A significantly smaller pelvic area in the Treatment A heifers may also have contributed, although there was no statistical correlation between pelvic area and incidence of dystokia.

I. INTRODUCTION

An earlier investigation determined the calving performance of two-year-old Hereford heifers fed at three levels of pre-calving nutrition (Hodge and Rowan 1970). The experiment reported in this paper was conducted on the same property using similar heifers calving in October and November of the following year.

Three regimes of pre-calving feeding, namely hay feeding for the final 16 weeks and 8 weeks of pregnancy, and normal grazing throughout pregnancy, were examined for their effects upon calving performance.

Dietary restriction of pregnant heifers has been proposed as a method of improving calving performance (Hodge and Rowan 1970; Young 1970). Accepting this hypothesis, this experiment aimed at defining which of two periods of restricted hay feeding would give the better calving performance. The criterion for superior calving performance was minimal incidence of dystokia and stillbirth.

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## II. MATERIALS AND METHODS

The property was located 60 km south-west of Miles in southern Queensland (mean annual rainfall 660 mm). Eighty-four Hereford heifers which had been paddock-mated to four Hereford bulls were allocated to the three treatments by stratified randomization based on fasted body weight and pregnancy status during the first trimester. Prior to hay feeding commencement, heifers shared common grazing.

### (a) Treatments

Treatment A - 16 weeks of hay feeding - nil grazing.

Two groups of 14 heifers were confined in 2 ha paddocks and group-fed once **daily** for the final 16 weeks of pregnancy on 5 kg of rye grass/clover hay per head.

Treatment B - 8 weeks of hay feeding - nil grazing.

Two groups of 14 heifers were confined in 2 ha paddocks and group-fed once daily for the final 8 weeks of pregnancy on 5 kg of rye **grass/clover** hay per head.

Treatment C - normal grazing.

One group of 28 heifers grazed a grass pasture of *Bothriochloa*, *Dichanthium* and *Chloris* species with Treatment A and B heifers until hay feeding commencement. Thereafter, Treatment C heifers continued to graze the same pasture until the calving period commenced. They were then confined in a 4 ha paddock and group-fed once daily on 5 kg of rye grass/clover hay per head to ensure that calving occurred under identical conditions in all treatments.

### (b) Observations

The 8 and 16 week pre-calving feeding periods were calculated from pregnancy status estimations. Two veterinarians made independent estimates of pregnancy status and agreement between operators was of a high order.

Hay feeding commencement was staggered by a fortnight between groups to ensure that actual duration of feeding was as near as possible to that intended. Treatment A groups commenced feeding on June 30 and July 14, while Treatment B groups commenced on August 25 and September 8. Samples of hay were analysed for dry matter and crude protein content (**A.O.A.C.** 1960).

Fasted body weights of heifers were recorded at each feed change after June 30 using the method described by **Wiltbank et al.** (1962). The final body weights were recorded eight days prior to the onset of the **calving** period on October 6. Body condition scores were recorded in the first (April 22) and final (October 6) trimester of pregnancy according to the method of Winks and **Lamberth** (1968).

Horizontal and vertical pelvic dimensions were measured with a rectal **calliper** on October 6. Pelvic area was calculated from the product of the horizontal and vertical measurements (Young 1968).

Heifers were inspected at least three times daily to detect calving difficulty. Veterinary assistance was rendered if a heifer had not successfully calved within four hours of the appearance of the amniotic sac or a

oetal extremity. Such cases were termed dystokias. Incidence of stillbirths, heifer and calf mortality and retained placental membranes was recorded.

As soon as possible after parturition calves were identified with their dams and measured for birth weight, head width, chest circumference, chest depth and body length. The heifers and their calves were then depastured on good quality feed.

### III. RESULTS

#### (a) Hay analyses

The rye grass/clover hay had a mean dry matter content of 88.3 per cent and a crude protein content of 12.5 per cent on a dry matter basis.

#### (b) Pre-calving data

During the final 16 weeks of pregnancy there was a trend for Treatment A heifers to gain less body weight than the Treatment B. Treatment B gained at the lowest daily rate during the final 8 weeks of pregnancy although treatment differences were non-significant. Final pre-calving body weights were similar (Table 1). Although treatment differences in body condition at each observation were not apparent, there was a loss in body condition as pregnancy progressed ( $P < 0.01$ ). Treatment A heifers had a smaller mean pelvic area ( $P < 0.01$ ) than either Treatment B or C heifers.

Daily observation indicated that a proportion of the Treatment A heifers became listless and disinterested in their surroundings as hay feeding progressed.

#### (c) Calving performance

The calving period was 59 days in duration. Heifers calved a mean 5 days earlier than their estimated calving date based on pregnancy diagnosis. Treatment A heifers that had become listless and depressed during prolonged hay feeding appeared to calve with insufficient effort and endurance.

Calf birth weights and body measurements for the three treatments were not significantly different (Table 1). Dystokia incidence was 17.9 per cent, 3.6 per cent and 10.7 per cent for Treatments A, B and C respectively. Stillbirth was also highest in Treatment A with 21.4 per cent, compared with 7.1 per cent for Treatment B and 3.6 per cent for Treatment C. Although there was a strong trend towards a higher incidence of dystokia and stillbirth in Treatment A, treatment differences for each of these criteria were not significant.

Calf birth weight was significantly correlated with the delivery of calves which were either involved in dystokia or stillborn ( $b = 0.027 \pm SE_b 0.013$ ) ( $P < 0.05$ ). When data was corrected for this birth weight correlation, the number of calves either involved in dystokia or still born was greater in Treatment A than Treatment B ( $P < 0.05$ ).

Calf birth weight was significantly correlated with dystokia incidence ( $b = 0.034 \pm SE_b 0.013$ ) ( $P < 0.05$ ). Calves with heavier birth weights required more assistance. However, calf birth weight was not related to the likelihood of stillbirth. Calf birth weight was also correlated with pelvic area ( $b = 0.104 \pm SE_b 0.023$ ) ( $P < 0.01$ ). However, there was no significant correlation between pelvic area and the incidence of dystokia.

TABLE 1

Pre-calving and calving performance in three treatments

		Hay-fed groups		Grazed group	Av. S.E. of	Significance
		A	B	C	Mean	
		(16 weeks)	(8 weeks)			
<u>Pre-calving data</u>						
Body weight 16 weeks pre-calving	(kg)	300.61	292.51	304.30	+ 2.71	A>B*, C>B**
Growth rate of heifers						
- final 16 weeks of pregnancy	(kg/day)	0.48	0.53	0.48	+ 0.04	N.S.
Growth rate of heifers						
- final 8 weeks of pregnancy	(kg/day)	0.54	0.32	0.43	+ .08	N.S.
Body weight of heifers 6.x.69	(kg)	344.02	341.77	350.60	+ 4.32	N.S.
Vertical pelvic measurement 6.x.69	(cm)	16.27	16.56	17.00	+ 0.13	C>A**, C>B*
Horizontal pelvic measurement 6.x.69	(cm)	14.18	14.90	14.37	+ 0.14	B>A**, B>C*
Pelvic area 6.x.69	(sq cm)	231.03	247.03	244.25	+ 3.37	B>A**, C>A**
<u>Calving data</u>						
Number of dystokias		5	1	3		N.S.
Number of stillbirths		6	2	1		N.S.
Total number dystokia and/or stillbirth		7	2	3		A>B *
Calf birth weight	(kg)	25.17	25.66	27.27	+ 0.68	N.S.
Calf head width	(cm)	11.7	11.64	11.92	+ 0.16	N.S.
Calf chest circumference	(cm)	67.23	68.80	69.60	+ 0.71	N.S.
Calf chest depth	(cm)	24.14	24.67	24.80	+ 0.31	N.S.
Calf body length	(cm)	53.66	53.03	53.83	+ 0.68	N.S.

\* P &lt; 0.05

\*\* P &lt; 0.01

In Treatment A two dystokias were considered to be due to **foeto-pelvic disproportion**, one due to foetal malpresentation and two due to maternal uterine inertia. The single dystokia in Treatment B was due to foetal malpresentation. All three dystokias in Treatment C were attributed to **foeto-pelvic** disproportion.

One heifer in Treatment A gave birth naturally to fraternal twins, one of which was stillborn. This stillborn calf was omitted from the statistical analysis. Its dam was the only heifer in the experiment to retain membranes longer than twenty-four hours. Two heifers in Treatment A suffered from calving paralysis following the use of a Nicholson foetal extractor. One such heifer was recumbent for 10 days prior to recovery. Another heifer in Treatment A produced a grossly undersized dead calf at term which weighed 17.7 kg.

Two heifers, one from Treatment B and one from Treatment C, died during parturition as a result of dystokia. Following dystokia, one calf in Treatment A and one calf in Treatment C perished at 4 and 2 days of age respectively.

#### IV. DISCUSSION

The hay level used was based on observation of heifer calving performance on different hay levels in the 1968 experiment (Hodge and Rowan 1970). The daily 5 kg of hay yielded 0.55 kg of crude protein and an estimated 2.75 kg T.D.N., supplying 80 per cent of protein requirements and 60.5 per cent of T.D.N. requirements (N.A.S. - N.R.C. 1968). This T.D.N. estimate is based on levels quoted by Morrison for grass-legume hays of comparable quality (Morrison 1959).

The pre-calving body weight performance of the grazing controls was inferior to that recorded on this property earlier (Hodge and Rowan 1970). This was attributed to the negligible **herbage** component in the pasture associated with below-average 1969 rainfall.

It is considered that the similarity of pre-calving body condition and body weight movements accounted for the similar mean calf birth sizes between treatments. In spite of this similarity of calf birth sizes there was a higher incidence of both dystokia and stillbirth in the longer-fed heifers. Although these individual incidence differences between treatments were non-significant, Treatment A produced more dead or difficult births than Treatment B when data were corrected for birth weight ( $P < 0.05$ ).

Heavier calves were more prone to dystokia occurrence. The same result was demonstrated on this property in 1967 (Rowan, unpublished data) and 1968 (Hodge and Rowan 1970).

It is inferred that the inferior calving performance of the Treatment A heifers can be mainly attributed to illthrift factors associated with prolonged confinement and under-nutrition. For instance, there may well have been prolonged partial restriction of exercise during the hay feeding period. Perhaps under-exercised heifers subsequently calve with less endurance. It seems unlikely that interference at calving was responsible for this inferior calving performance since all treatments calved under identical conditions (Dufty 1972). The smaller pelvic area of the Treatment A heifers may have been a contributing factor, although pelvic area was not correlated with dystokia incidence.

The results of this experiment suggest that prolonged confinement and hay feeding of pregnant heifers, in order to restrict their diet, could be detrimental to calving performance.

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