RELATIONSHIP BETWEEN THE OCCURRENCE OF PUBERTY IN HEIFERS AND THE CESSATION OF LUTEAL ACTIVITY AFTER NUTRITIONAL RESTRICTION

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Story in Brief

The relationship between the occurrence of puberty with the cessation of luteal activity after nutritional restriction was evaluated in fifteen Angus x Hereford heifers. Heifers attained puberty at a body weight of 655 lb and a BCS of 5.5. After 5.1 months of nutritional restriction, heifers became anestrus at a weight of 602 lb and a BCS of 3.0. The Spearman's rank correlation coefficient between date of puberty and date of cessation of luteal activity was -.50 ($P < .06$). This indicates that the heifers that attained puberty first were the last to cease luteal activity during nutritional restriction.

(Key words: Anestrus, Heifer, Nutrition, Progesterone, Puberty.)

Introduction

Age at the onset of puberty, is a major limitation for efficient beef production. Increased feed intake increases weight gain and usually decreases the age at which heifers reach puberty. The mechanism by which nutrition influences reproduction in cows has not been established, but it is documented that body condition influences reproductive performance (Selk et al., 1988). The objective of this study was to evaluate the relationship between the occurrence of puberty with the cessation of luteal activity after nutritional restriction.

Materials and Methods

Fifteen Angus x Hereford heifers were fed a complete diet to supply NRC requirements from 8 months of age until puberty. After all heifers exhibited normal estrous cycles, nutritional anestrus was induced by feeding a limited diet of 6.6 lb of low quality hay per day.

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Blood samples were taken biweekly before puberty and weekly after puberty. Concentrations of progesterone were determined by radioimmunoassay. Onset of puberty was considered to have occurred at the first of two successive weekly samples when concentrations of progesterone were greater than 1 ng/ml. Cessation of ovarian luteal activity was indicated by concentrations of progesterone less than 1 ng/ml for more than one week.

Results and Discussion

Heifers attained puberty at 14.1 ± 0.2 months of age. At puberty, heifers weighed 655 ± 13 lb and had a body condition score of 5.5 ± 0.1 (BCS; 1=emaciated, 9=obese).

About 5 months after all heifers exhibited normal luteal activity, nutritional anestrus was induced by feeding a limited diet of 6.6 lb of low quality hay per day. Luteal activity, or estrous cycles, ceased after diets of heifers were restricted for 5.1 ± 0.5 months. At the onset of anestrus, heifers weighed 602 ± 18 lb and had a BCS of 3.0 ± 0.2. Although heifers were an average of 10.5 months older at the onset of anestrus than at puberty, they weighed 8% less ($P < .02$) and had 45% less BCS ($P < .01$) (Figure 1).

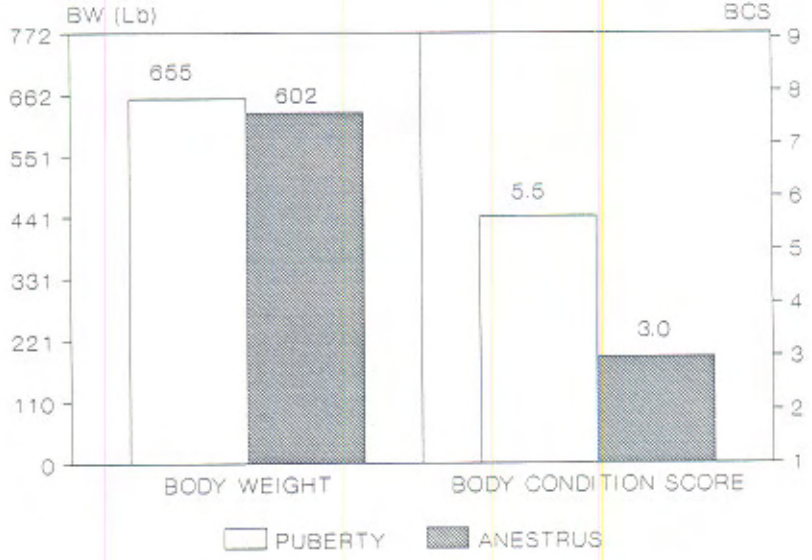

Figure 1. Body weight and body condition score of heifers at puberty and at anestrus.

The number of days of restricted feeding to induce anestrus is summarized in Figure 2. Heifers were divided into three groups based on the number of days to puberty after the start of the evaluation of pubertal cycles. Heifers that started luteal activity during the first two weeks (early), required 185 days of nutritional restriction to become anestrus (n=8). The heifers that started cycling 28-48 days later (moderate) needed 136 days (n=3) and the animals that started cycling last needed 106 days (n=4) to stop cycling. A Spearman's rank correlation coefficient was computed between date at puberty and the date at cessation of luteal activity. The correlation ($r=-.50$; $P < .06$), indicates that the heifers that first attained puberty were the last to cease luteal activity during nutritional restriction.

Body weight and body condition score did not differ between groups at the initiation of nutritional restriction or at the onset of anestrus (Table 1). However, the daily weight loss was greater in the "late" group compared with the "early" group.

Identification of heifers that initiate puberty at a younger age may represent animals with the ability to continue estrous cycles with reduced nutrient intake.

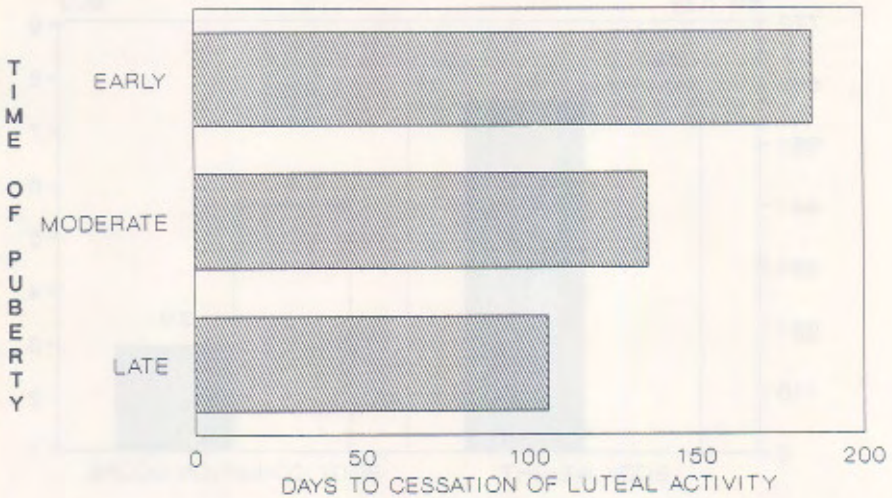

Figure 2. Relationship between time of puberty and days of nutritional restriction until the cessation of luteal activity.

Table 1. Body weight (BW) and body condition score (BCS) of heifers at initiation of nutritional restriction and at anestrus.

	Time of Puberty		
Characteristic	Early	Moderate	Late
Initial BW,lb	781	776	798
Initial BCS	5.6	5.2	5.3
Total BW loss to anestrus, lb	194	163	172
Daily BW loss to anestrus, lb	1.0[a]	1.3[ab]	1.7[b]
BCS loss to anestrus	1.8	2.0	2.9

[ab] Means with different superscripts differ ($P < .01$).

Literature Cited

Selk, G.E. et al. 1988. Relationships among weight change, body condition and reproductive performance of range beef cows. J.Anim. Sci. 66:3153.