

EFFECT OF BODY CONDITION AND
NUTRIENT INTAKE OF PREGNANT BEEF
COWS LATE IN PREGNANCY ON UTERINE
FUNCTION AND FETAL DEVELOPMENT

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Story in Brief

Seventeen mature pregnant Hereford cows were used to determine the effect of body condition (fat reserve) on uterine function and fetal development. At about 180 days of gestation, cows were taken to drylots and fed native hay and a protein supplement to achieve a thin (TH) or moderate (M) body condition. On 259 ± 1 day of gestation, cows were slaughtered and tissues were evaluated. Body condition scores (1 = emaciated; 9 = obese) at slaughter were $3.7 \pm .3$ for TH cows and $5.7 \pm .2$ for M cows. Body weights were 922 ± 35 lb for TH and 1122 ± 33 lb for M cows. Treatment did not influence uterine weight, ovarian wet or dry weight, follicular fluid weight, number of caruncles, caruncular weight, pituitary weight, fetal weight, crown rump length or total placental fluid volume. However, TH cows had heavier total cotyledonary and placental weights when compared to M cows. Regardless of preslaughter treatment, bull fetuses were heavier and had longer crown rump lengths than heifer fetuses. Furthermore, cows with bull fetuses had heavier total placental weights than cows with heifer fetuses. These data suggest that cows in thin body condition late in gestation have heavier placental and cotyledonary weights. Increases in placental and cotyledonary weights may enhance nutrient transport to the fetus and permit normal fetal growth with thin cows.

Introduction

Many factors dictate calf weight, calf survival at birth and subsequent rebreeding performance of beef cows. One of the most critical times in a beef cow's production cycle when optimal nutrition is required is during the last trimester of pregnancy. Malnutrition of cows during late gestation increases the incidence of calf mortality at birth and reduces calf growth rate after birth due to a reduction in milk production by the dam. In addition, cows that calve in poor body condition have longer intervals from calving to first estrus than do cows that calve in good body condition. Reduced nutrient intake during the last 60 days of gestation has variable effects on calf birth weight. Research indicates that beef cows that have been restricted nutritionally in late gestation often have lighter calves compared to cows with adequate nutrition.

The purpose of this experiment was to determine the effect of body condition and nutrient intake late in gestation on uterine function and fetal development in beef cows.

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Materials and Methods

Seventeen mature pregnant Hereford cows were used to determine the effect of body condition (an estimate of fat reserve) on uterine function and fetal development. Cows were maintained in grassless pens and fed native hay and a 41% protein supplement to achieve a thin (TH) or moderate (M) body condition at slaughter in late gestation. Body condition scores (1 = emaciated; 9 = obese) were assessed independently by at least two individuals at weekly intervals beginning about 60 days before slaughter. Conception date was determined by breeding date and was verified by rectal palpation at 40 to 60 days after breeding.

Cows were slaughtered on 259 ± 1 day of gestation. At slaughter the pituitary gland was removed and the total and anterior pituitary were weighed. The reproductive tract was severed posterior to the cervix and the uterus and contents were removed and weighed. An incision was made through the uterus and placental membranes, and amniotic and allantoic fluids were aspirated and fluid volumes were recorded. Sex, weight and crown rump length of each fetus was determined. Uteri, cotyledons and caruncles were dissected, counted and weighed.

The ovaries were trimmed of all mesovarian tissue and ovarian wet weights were determined. In addition, the corpora lutea were dissected and weighed. Ovaries were minced, blotted dry and reweighed to determine follicular fluid weight. Ovarian dry weight was determined by drying the ovaries for 72 hr at 50 C. Data were analyzed by analysis of variance.

Results and Discussion

Average body weight was heavier ($P < .001$) and average body condition score was greater ($P < .001$) for M cows (1122 ± 33 lb; $5.7 \pm .2$ units) than for TH cows (922 ± 35 lb; $3.7 \pm .2$ units) at slaughter (Table 1). Total pituitary or anterior pituitary weights, ovarian wet or dry weights and corpora lutea or follicular fluid weights were similar for cows in thin or moderate body condition late in gestation.

Table 1. Body condition score, body, pituitary and ovarian weights of cows at slaughter.

Criteria	Body Condition	
	Thin	Moderate
Cows (no.)	8	9
Final body weight (lb) ^{a, b}	922 ± 35	1122 ± 33
Final body condition ^b	3.7 ± .2	5.7 ± .2
Total pituitary wt. (g)	2.5 ± .1	2.6 ± .1
Anterior pituitary wt. (g)	2.0 ± .1	2.0 ± .1
Ovarian wet wt. (g)	15.28 ± 1.32	15.35 ± 1.25
Ovarian dry wt. (g)	1.90 ± .25	1.62 ± .23
Corpus luteum wt. (g)	4.18 ± .45	4.64 ± .42
Follicular fluid wt. (g)	1.58 ± .19	1.87 ± .18

^a Least square means (± SE)

^b Differ ($P < .001$).

Each cow had a single fetus. In total, cows on the M treatment had 5 heifer fetuses and 4 bull fetuses and TH cows had 5 heifer fetuses and 3 bull fetuses. Average fetal weights and crown rump lengths were

similar for fetuses from TH and M cows. Regardless of treatment, bull fetuses (66 ± 4 lb) were heavier ($P < .02$) than heifer fetuses (53 ± 2 lb) and had longer ($P < .02$) crown rump lengths ($34.0 \pm .7$ vs $32.0 \pm .6$ in.).

Neither nutrient intake nor body condition score of the dam during the last trimester of gestation influenced uterine weight, caruncular weight or numbers, or total amniotic or allantoic fluid volumes (Table 2). However, TH cows had heavier ($P < .05$) total cotyledonary weights and heavier ($P < .08$) fetal membranes compared to cows on the M treatment. Further, cows with bull fetuses had heavier ($P < .10$) fetal membranes than cows with heifer fetuses ($2.822 \pm .212$ vs $2.357 \pm .176$ lb).

Table 2. Uterine and placental parameters for cows in thin or moderate body condition.

Criteria	Body Condition	
	Thin	Moderate
Uterine wt. (kg)	$4.0 \pm .2^a$	$4.4 \pm .2$
Caruncles (no.)	90 ± 7	93 ± 7
Total Caruncular wt. (kg)	$2.844 \pm .205$	$2.779 \pm .194$
Fetal membranes ^b (kg) ^c	$1.253 \pm .103$	$1.053 \pm .082$
Cotyledonary wt. (kg) ^d	$1.904 \pm .157$	$1.422 \pm .144$
Total placental fluid vol. (ℓ)	$7.310 \pm .745$	$6.822 \pm .703$
Amniotic fluid vol. (ℓ)	$1.354 \pm .287$ (7)	$1.935 \pm .307$ (6)
Allantoic fluid vol. (ℓ)	$5.431 \pm .780$ (7)	$4.703 \pm .842$ (6)

^aLeast square means (\pm SE)

^bFetal membranes include the chorioallantois and amnion without cotyledons.

^cDiffer ($P < .08$).

^dDiffer ($P < .05$).

Number in parentheses is the number of observations if less than 8 for thin and less than 9 for moderate treatments.

These data suggest that cows with reduced nutrient intake and in thin body condition in late gestation have heavier placentas which may enhance nutrient transport to the fetus and permit normal fetal growth.