PLASMA CONSTITUENTS AND OVARIAN FUNCTION OF BEEF COWS TREATED WITH GROWTH HORMONE-RELEASING FACTOR

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Story in Brief

Hereford and Hereford x Angus cows were used to evaluate the effects of growth hormone releasing factor (GRF) on postpartum performance. Cows were infused with GRF or saline 3 times daily on days 25 to 45 post partum. Treatment with GRF increased growth hormone and non-esterified fatty acids in the blood, and feed intake was increased. Secretion of luteinizing hormone was not altered by treatment. Treatment of lactating anestrous cows for 21 days did not influence calf growth or the interval to the onset of ovarian luteal activity.

(Key Words: Anestrus, Beef Cow, GRF, Growth Hormone, Postpartum.)

Introduction

Treatment of cattle with growth hormone-releasing factor (GRF) increases concentrations of growth hormone (GH) in serum. Treatment of lactating dairy cows with bovine growth hormone increases milk yield and changes in blood and milk lipids indicate mobilization of adipose tissue reserves.

If nutrient intake is inadequate and body energy reserves are depleted, the interval from calving to the first estrus is extended in beef cattle. Body energy reserve at calving is an important factor that influences subsequent pregnancy rate. Secretion of LH is a limiting factor to the initiation of postpartum estrous cycles. Infusion of lactating beef cows with glucose will decrease concentrations of non-esterified fatty acids (NEFA) in plasma and increase luteinizing hormone (LH) secretion.

Growth hormone may partition dietary energy in dairy cows between body tissue, milk, heat, methane, feces and urine. Postpartum beef cows have less potential for milk production than dairy cows and alterations in energy metabolism may provide nutrients to enhance secretion of LH and stimulate ovarian function. The objectives of this experiment were to determine the effect of three times daily infusion of postpartum beef cows with GRF on concentrations of glucose and NEFA in plasma, LH and insulin in serum, and ovarian function.

Materials and Methods

Ten mature anestrous Hereford cows at 25 ± 2 d post partum were used to determine the effect of treatment with GRF on blood constituents and ovarian function. Cows received rations during the last 90 d of gestation so that body weights and body condition scores (BCS; 1 = emaciated, 9 = obese) were 881 ± 44 pounds and 4.9 ± .2, respectively,

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at parturition. During the first 85 d after calving, cows were fed cotton seed meal (41% CP) in addition to grass pasture to permit weight gain (about 0.4 kg/day). Cows were cohabited with androgenized cows with chinball markers and concentrations of progesterone in plasma collected each week were used to select anestrous cows.

On day 22 post partum, cows and calves were removed from range pasture and pairs were maintained in individual pens in a building. Daily intake of a 12% protein ration, supplied ad libitum, was determined. On day 25 post partum, a cannula was inserted into the jugular vein of each cow. Cows were blocked by calving date and received either human GRF (hGRF-(1-29)-NH_2; 3 µg/kg) or saline, intravenously, at 0800, 1400 and 2000 h daily through day 45 post partum. Blood samples were obtained daily at 0800 and 0830 and at 10 m intervals for 8 h on day 42 post partum.

Estimates of 24-h milk production were made by the calf-weight-change technique before (day 23 post partum) and during (day 44 post partum) treatment.

On day 46 post partum, cows were returned to pasture and cohabited with fertile bulls until at least 90 d post partum. Progesterone was quantified in weekly blood samples between 46 and 85 d post partum to assess ovarian luteal activity. Pregnancy rate was determined at 90 d post breeding and day of conception was calculated by subtraction of 280 d from the subsequent parturition. An LH pulse was defined as any value greater than 2 standard deviations above the mean for a cow. Basal LH was determined by averaging all LH values < 2 ng/ml.

Results and Discussion

Body weights were similar for control and GRF treated cows at the start of treatment. Weight gains and BCS changes during treatment were similar for cows on both treatments. Cows gained an average of 0.29 kg/d. Feed intake was greater ($P<.05$) for GRF treated (17.2 ± .4) than for control cows (15.7 ± .4 kg/d).

Concentrations of GH in serum were increased by infusion with GRF. Concentrations of GH increased ($P<.001$) from .6 ± .6 ng/ml before infusion to 15.8 ± .6 ng/ml at 30 m after GRF infusion.

Milk production and the change in milk production during treatment were not significantly influenced by treatment. Similarly, average daily gain of the calves and weaning weights were not altered by GRF treatment. Average daily gain of the calves was correlated with milk production of the dam ($r = .74$; $P<.05$) and feed intake of the dam (.68; $P<.05$).

There was a treatment x day effect on concentrations of NEFA in plasma (Figure 1). During the first 9 days of treatment, NEFA's in plasma were greater in GRF treated than control cows. However, after day 10, concentrations were similar in GRF treated and control cows.

Concentrations of glucose in plasma were influenced by day of treatment (Figure 2; $P<.05$). Although not significant ($P<.12$), there was a tendency for a treatment x day effect on glucose in plasma. Concentrations of glucose tended to be greater in GRF treated than in control cows during days 10 through 21 of treatment. The average concentration of glucose in a cow for the 21 d period was correlated with average daily gain of the calf ($r = .76$; $P<.01$). Concentrations of insulin in serum were influenced by day ($P<.001$), but were not affected by treatment.

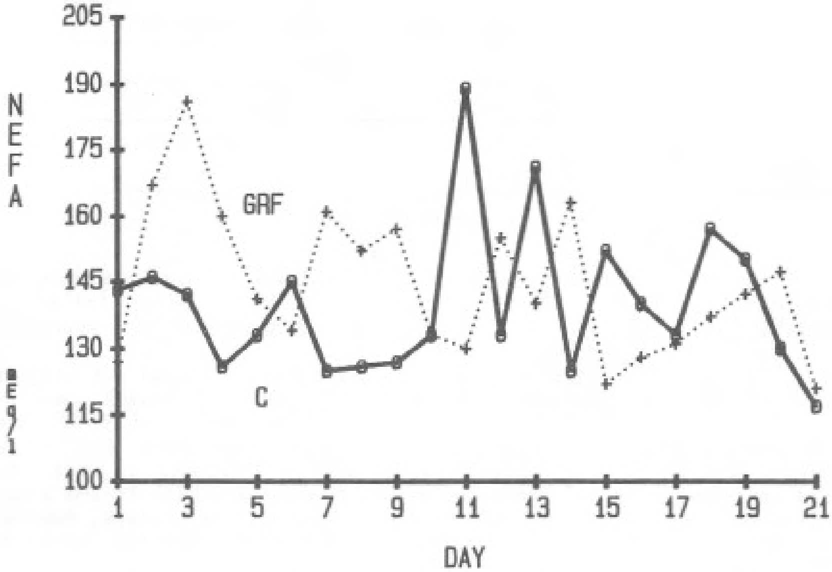

Figure 1. Concentrations of non-esterified (NEFA) in the plasma of control beef cows and cows treated with GRF three times daily after calving. The first day of treatment (Day 1) was 25 ± 2 d post partum.

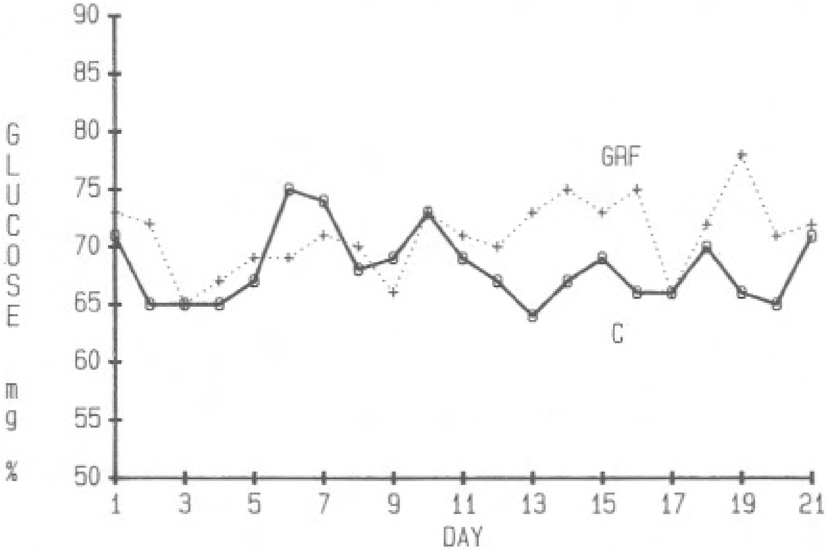

Figure 2. Concentrations of glucose in the plasma of control beef cows and cows treated with GRF three times daily after calving. The first day of treatment (Day 1) was 25 ± 2 d post partum.

Table 1. Serum LH in postpartum beef cows treated with GRF.

Criteria	Treatment	
	Control	GRF
Basal LH, ng/ml	.97 ± .16	.86 ± .11
Pulses per 8 h	2.0 ± .6	2.0 ± .4

Secretion of LH on day 18 of treatment was not influenced by GRF treatment (Table 1). Basal concentrations of LH were similar for control and GRF treated cows, and cows on both treatments had an average of 2 pulses of LH per 8 h.

The number of days until the onset of ovarian luteal activity was not affected by treatment and averaged 70 ± 6 for control cows and 73 ± 5 for GRF cows. Four of 5 control cows and 3 of 5 GRF cows conceived and the days from calving to conception were similar for control and GRF treated cows, respectively. Treatment of postpartum anestrous cows with GRF increased growth hormone and NEFA in the blood, increased feed intake, and tended to increase plasma glucose, however, secretion of LH, milk production and ovarian function were not influenced.