

PLASMA CONSTITUENTS IN BEEF COWS FOLLOWING TREATMENT WITH EPINEPHRINE

J.W. Castree¹, R.P. Wettemann², K.S. Lusby³ and D.S. Buchanan⁴

Story in Brief

Metabolic differences in lactating beef cows were evaluated by quantifying glucose, insulin, and non-esterified fatty acids in plasma after treatment with epinephrine. Ten Hereford and Angus x Hereford cows selected during their first lactation based on the average daily gain of their calves and the interval from calving to the onset of luteal activity were utilized. Cows with performance greater than the average of herdmates were assigned to the Above group (n=5) and cows with performance less than the average of herdmates were assigned to the Below group (n=5). All cows were infused with epinephrine (.7 $\mu\text{g}/\text{kg}$ body weight) and frequent plasma samples were obtained via cannulae. Concentrations of glucose, insulin, and non-esterified fatty acids in the plasma of all cows increased following epinephrine. Cows in the Above group tended to have greater concentrations of non-esterified fatty acids in plasma following epinephrine than cows in the Below group. Insulin in the plasma after epinephrine was less in Above than Below cows. Concentrations of glucose in plasma were not different between cow groups. An epinephrine challenge may be useful to evaluate fat mobilization and plasma concentrations of non-esterified fatty acids and insulin in lactating beef cows.

(Key Words: Beef Cow, Epinephrine, Glucose, Insulin, NEFA.)

Introduction

The interval from calving to the onset of luteal activity and the average daily gain of the calf are two important criteria when evaluating beef cow performance. A cow must rebreed within 82 days following calving to maintain a yearly calving interval. Sixty percent of a calf's 205-day weaning weight is dependent on maternal lactation. Nutrient intake and the body energy reserves of a cow influence milk production and the ability to rebreed.

¹Graduate Assistant ²Regents Professor ³Professor ⁴Associate Professor

Richards et al. (1987) suggests that reduced concentrations of glucose and insulin in plasma are associated with nutritional anestrus. Concentrations of non-esterified fatty acids (NEFA) in plasma of cows are an indication of the rate of fat mobilization and may be useful to evaluate the energy status of the postpartum cow (Garmendia et al., 1986). The objective of this study was to evaluate the effect of epinephrine on concentrations of glucose, insulin, and NEFA in the plasma of lactating beef cows with above average or below average calf growth and reproductive performance.

Materials and Methods

Ten mature Hereford and Angus x Hereford cows were ranked during their first lactation based on average daily gain (ADG) of their calf and the interval from calving to the onset of luteal activity. Five cows with performance greater than the average of herdmates were assigned to the Above group and 5 cows with performance less than the average of herdmates were assigned to the Below group. At approximately 60 days post partum during the third or fourth lactation, cows were maintained in individual stanchions with their calves present and fed to NRC requirements. Cows were in moderate body condition [BCS = 4.6 .3 (1=emaciated and 9=obese) weight=956 lb]. Cows were infused with .7 $\mu\text{g}/\text{kg}$ BW of epinephrine via an indwelling jugular cannulae. Frequent plasma samples were obtained via cannulae from 30 minutes before epinephrine infusion until 3 hours after infusion. Concentrations of glucose, insulin, and NEFA in plasma were quantified.

Results and Discussion

Production traits of cows and calves from the Above and Below groups (Table 1) were not significantly influenced by cow groups during the third or fourth lactation. However, the cows in the Above group tended to wean heavier calves and to initiate ovarian function sooner after calving.

Table 1. Least-squares means of production traits.

Trait	Group	
	Above	Below
Weaning weight, lb	499.4	464.8
Average daily gain of calves, lb.	2.46	2.10
Onset luteal activity, d	57.8	66.6

Concentrations of glucose, insulin, and NEFA in the plasma of all cows increased following epinephrine infusion and attained maximum concentrations within 10 to 15 minutes following treatment. This increase in the concentration of all plasma constituents indicates that the dose of epinephrine was sufficient to elicit a response.

Below cows tended to have greater concentrations of insulin in plasma than Above cows ($P < .10$) following epinephrine treatment (Figure 1). Concentrations of NEFA in the plasma of Above cows were greater than that for Below cows ($P < .05$) after treatment with epinephrine (Figure 2). The increased NEFA in Above cows indicate a greater mobilization of body fat following treatment. There were no significant differences in the concentrations of glucose in the plasma of Above and Below cows following epinephrine infusion (Figure 3).

The mean concentrations of NEFA in the plasma of all cows after treatment with epinephrine were correlated with ADG of the calves ($r = .89$) and weaning weights ($r = .94$). Cows with a greater ability to mobilize body energy stores may have an increased potential for milk production which can result in greater ADG and heavier weaning weights of calves.

We conclude that an epinephrine infusion may be useful to evaluate fat mobilization and plasma concentrations of NEFA and insulin in lactating beef cows.

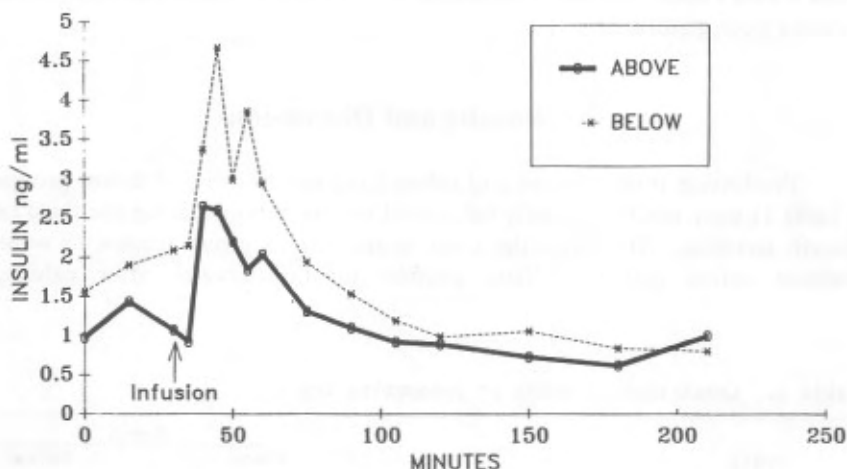


Figure 1. Concentrations of insulin in plasma of beef cows after epinephrine.

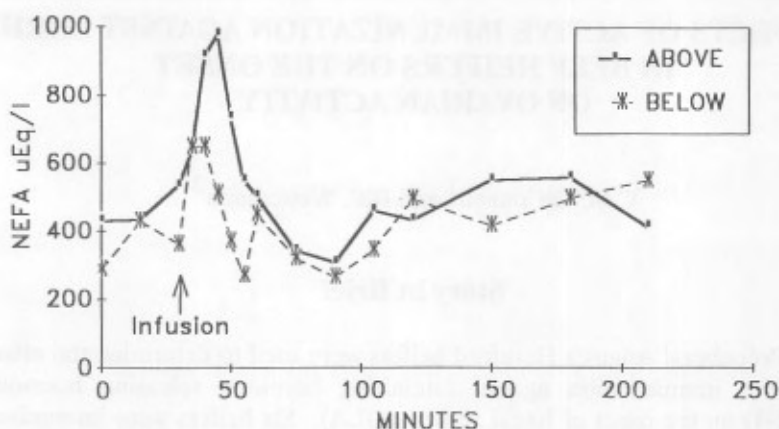


Figure 2. Concentrations of NEFA in plasma of beef cows after epinephrine.

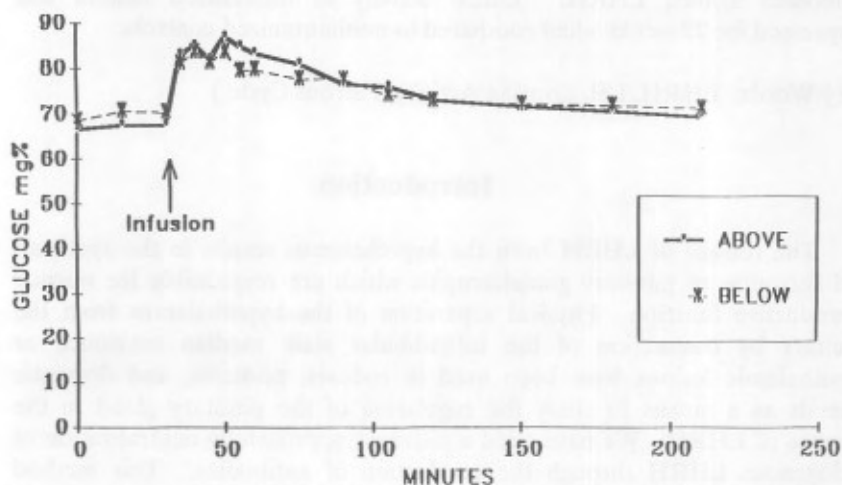


Figure 3. Concentrations of glucose in plasma of beef cows after epinephrine.

Literature Cited

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