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EFFECTS OF EXOGENOUS GLUCOSE OR COLOSTRUM ON BODY TEMPERATURE, PLASMA GLUCOSE AND SERUM INSULIN IN NEWBORN COLD STRESSED BRAHMAN CALVES

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SUMMARY

Newborn Brahman calves exposed to cold (41°F) weather immediately after birth are unable to maintain normal body temperatures. Feeding colostrum to these cold-stressed calves had no effect on declining body temperatures. Body temperatures were maintained in cold exposed calves which received a 341 mg/lb body weight intravenous (iv) infusion of exogenous glucose (50% weight/volume), but body temperatures were not maintained in colostrum fed calves. Blood glucose and insulin concentrations were greater in newborn calves infused with exogenous glucose compared to newborn calves fed colostrum; however, cold-stressed calves fed colostrum had elevated glucose concentrations when compared to non-cold-stressed contemporaries. These increased glucose concentrations may be related to or caused by the low concentrations of insulin detected during cold exposure. Infusion (iv) of glucose but not feeding colostrum was able to supply substrates to the tissue of newborn Brahman calves and to mediate the affects of chilling.

INTRODUCTION

The objective of this research was to compare effects of environmental temperature on newborn Brahman calves through evaluation of body temperature, plasma glucose and serum insulin concentrations in response to exogenous glucose or colostrum in newborn cold-stressed Brahman calves.

PROCEDURES

Newborn Brahman calves (26 head) were removed from their dams within 30 minutes of birth and prior to suckling. Calves were placed in either a warm (77°F) or cold (41°F) environment and were equally assigned to receive either colostrum or exogenous glucose. Jugular blood samples were collected every 15 minutes for 2.5 hours and at hours 3, 4 and 5. Body temperature was recorded at each sample time.

Immediately following the 60 minute blood sample, all calves were either fed 2.5 pints of warm colostrum obtained from their respective dams or received an intravenous infusion (341 mg/lb body weight) of warm glucose. At 150 minutes, cold treated calves were placed in the warm environment for the remainder of the sampling period. Each blood sample was analyzed for plasma glucose and serum insulin concentrations.

RESULTS

Brahman calves exposed to 41°F were found to have lower ($P<.02$) body temperatures than Brahman calves maintained at 77°F. The cold exposed calves fed colostrum had lower ($P<.05$) body temperatures than all warm treatment calves from 90 through 180 minutes (Figure 1). Cold treated calves given glucose did not have lower ($P>.10$) body temperatures than warm treatment calves. Glucose concentrations increased dramatically ($P<.0001$) in all glucose infused calves compared to all colostrum fed calves during the early postinfusion period. Glucose infused calves were observed to have lower ($P<.02$) glucose concentrations at the 4 and 5 hour samples compared with the colostrum fed calves (Figure 2). Cold treated calves fed colostrum had higher ($P<.05$) glucose concentrations than warm calves fed colostrum at the 90, 105 and 135 minute samples (Figure 2). Insulin differed ($P<.05$) between colostrum fed and glucose infused calves and was affected by a temperature x feeding interaction ($P<.05$). All glucose infused calves had higher insulin concentrations than colostrum fed calves early in the sampling period with colostrum fed calves being higher later in the sampling period (Figure 3). Cold exposed calves fed colostrum had the lowest insulin concentrations before they were transferred to the warm environment; however, cold-exposed glucose-infused calves had the highest insulin concentrations at the 75 minute sample. Warm treated calves infused with glucose had the greatest insulin response (Figure 3). Sex of calf did not affect body temperature, plasma glucose or serum insulin concentrations. Birth weights were similar between all calves.

The conclusions from this study are that glucose infusion and colostrum feeding should be utilized when a producer encounters chilling in newborn Brahman calves. The glucose infusion will give immediate substrate for maintenance of body temperature and the colostrum will give longer lasting substrates for body functions.

KEY TO ALL LEGENDS

(PRE TR) Warm or Cold treatment calves prior to feeding colostrum or infusion (iv) of glucose.

(W C) Warm treatment calves fed colostrum.

(C C) Cold treatment calves fed colostrum.

(WEG) Warm treatment calves infused with glucose.

(CEG) Cold treatment calves infused with glucose

RECOMMENDED DOSES OF EXOGENOUS GLUCOSE (341 mg/lb. body wt.) INJECTION (iv)

Birth weight (lbs)	cc's of glucose (50% soln.)
<50	30 cc
50	35 cc
55	37.5 cc
60	41 cc
65	44.5 cc
70	47.5 cc
75	51 cc
80	54.5 cc
85	58 cc
90	61.5 cc
>90	65 cc

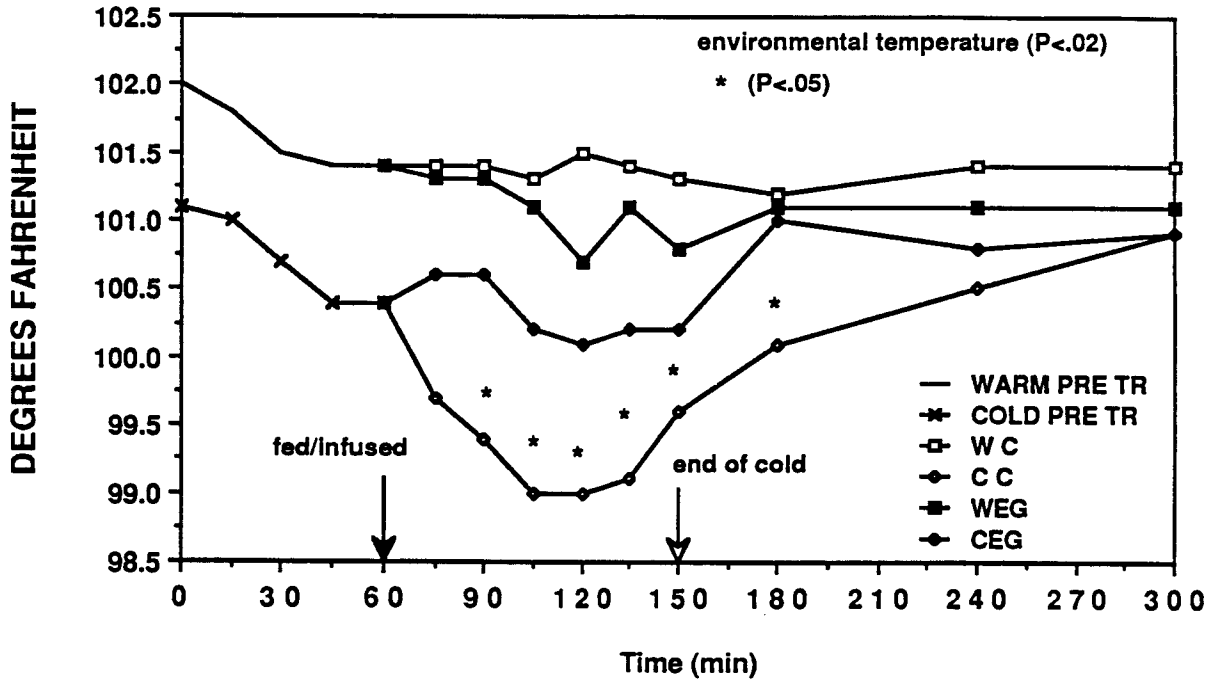

Figure 1. AVERAGE BODY TEMPERATURE OF NEWBORN BRAHMAN CALVES.

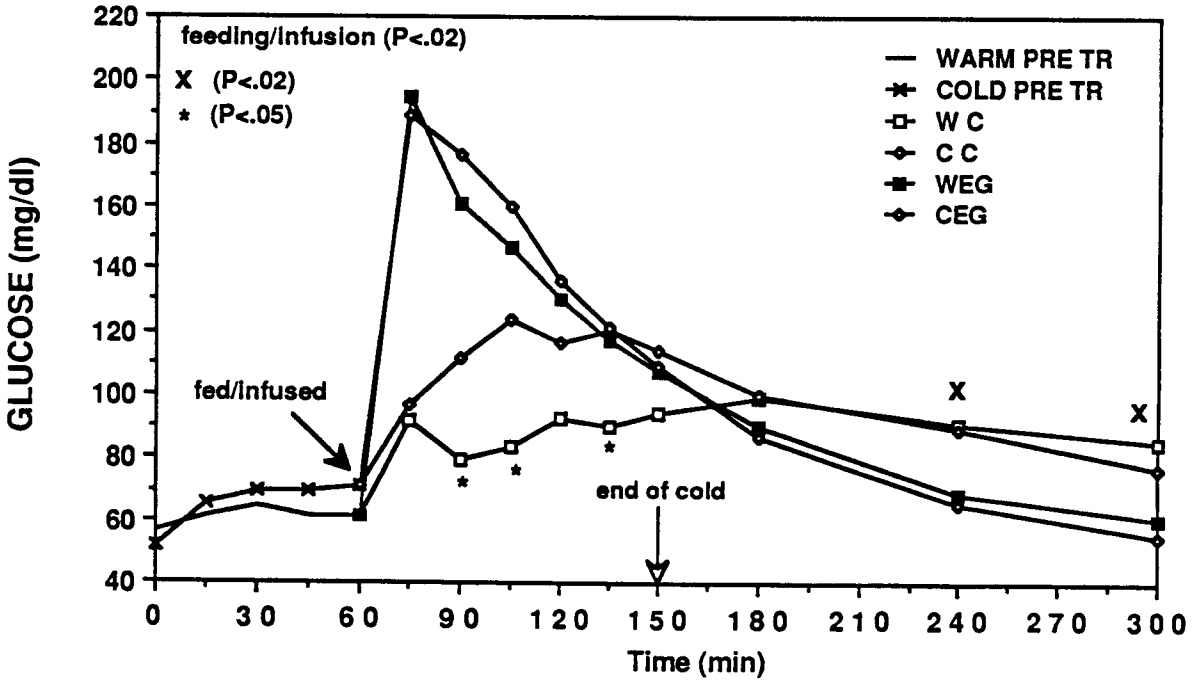

Figure 2. AVERAGE BLOOD GLUCOSE OF NEWBORN BRAHMAN CALVES.

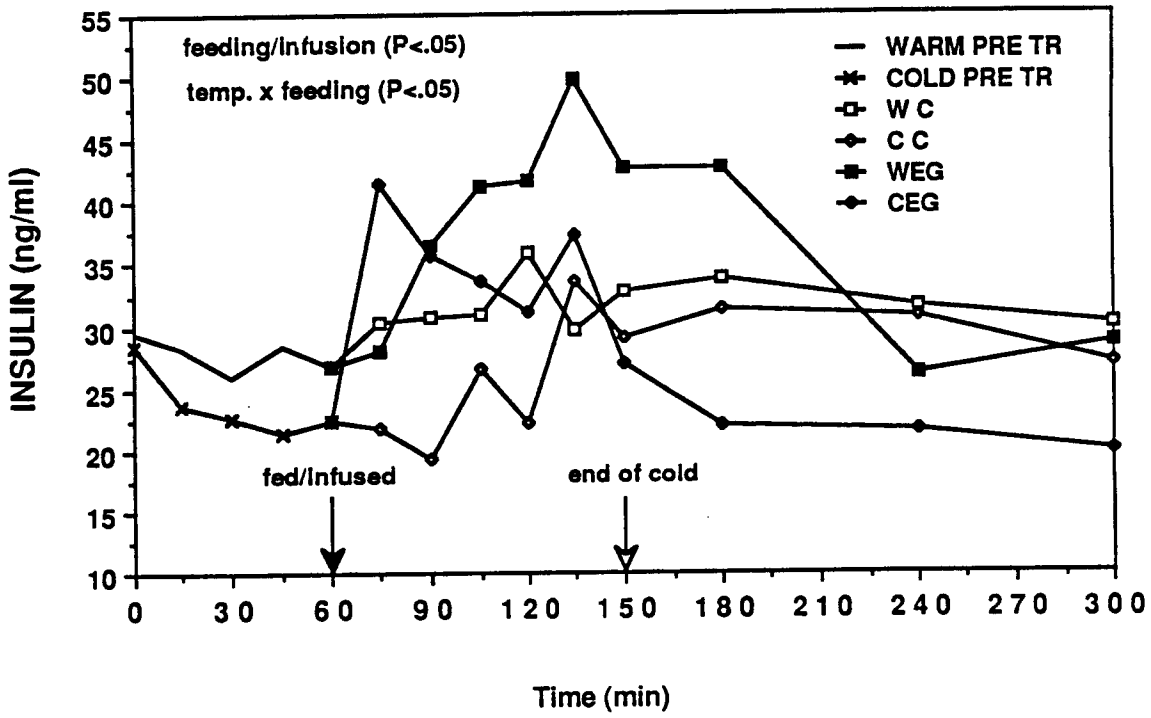

Figure 3. AVERAGE BLOOD INSULIN OF NEWBORN BRAHMAN CALVES