Effects of Elevated Ambient Temperatures on Gestation Lengths of Beef Cows

E.C. Wright, M.J. Prado-Cooper, N.M. Long, and R.P. Wettemann

Story in Brief

Effect of ambient temperature on length of gestation was evaluated for early (August) and late (October) fall calving beef cows. Twenty-four Angus x Hereford cows were artificial insemination (AI) to calve in early or late fall. Cows grazed native pasture from AI to calving and were fed supplemental protein to maintain a body condition score (BCS) of ~4.5 during the winter. Cows that calved in August had shorter gestations (275.2±1.3d; P = 0.07) than cows calving in October (278.8±1.4). Elevated temperatures during late gestation may shorten gestation of beef cows.

Key words: Fall Calving, Beef Cows, Gestation Length, Heat Stress

Introduction

Fall calving in Oklahoma can be profitable due to readily available summer forage at the time of calving and greater calf prices at weaning in late spring. Fall calving may occur between August and December. Climatic conditions change drastically during these months in Oklahoma and environmental changes, particularly temperature, may influence length of gestation. Average length of gestation for beef cows is 281 d, and can be influenced by breed, genetics, number of calves, sex of calf, and environmental stresses. Kastner et al. (2004) observed that heat stress shorted gestation in fall calving beef cows. Parturition is initiated by the calf: the hypothalamus secretes corticotropin releasing hormone which causes secretion of adrenal corticotropic hormone by the pituitary and glucocorticoids. This initiates a cascade of events in the endocrine system of the cow, resulting in reduced progesterone secretion by the placental and/or the corpus luteum and parturition. Calves born in the fall tend to have a reduced birth weight compared with spring calves (Selk et al., 1990). Length of gestation may be associated with birth weight. The objective of this study was to determine if elevated ambient temperature causes a premature decrease in plasma concentrations of progesterone in cows and a shorter gestation.

Materials and Methods

Mature Angus x Hereford cows (n = 24) were assigned to either August or October calving seasons. Cows were injected with gonadotropin-releasing hormone (GnRH) on d 0 and a CIDR was inserted. On d 7 the CIDR was removed and cows were treated with prostaglandin. A second injection of GnRH was given on d 9 and cows were AI to one of two Angus bulls. Cows grazed native range pastures and were given supplemental protein to maintain body weight during the winter months. August calving cows were AI on November 11 and Oct calving cows were AI on January 5. Two wk prior to the expected calving date blood plasma samples were obtained by puncture of the tail vein every 2 to 3 d until 2 d after calving and concentrations of progesterone were quantified by radioimmunoassay. Ambient temperatures were obtained from the mesonet (http://www.mesonet.org/) for Marena, located 1.0 mile south of the pasture.

Results and Discussion

Length of gestation in four pervious years for this herd was shorter for cows that calved in Aug (278.4± 0.8 d, n = 38; P < 0.05) than for cows that calved in Oct (282.5 ± 0.9 d, n = 32; Table 1). Maximum ambient temperature was greater (P < 0.001) for all four yrs with a mean of 31.6 ºC and a range from 28.3 to 34.4 ºC compared with the Oct maximum ambient temperature mean of 19.7 ºC and a range of 16.1 to 23.3 ºC.

Table 1. Effect of calving month on temperature and length of gestation in beef cows for 4 previous yr.

	Gestation, d		Max Ambient Temp at calving, ºC	
Year	August	October	August	October
1	279.1[a]	285.3[b]	34.4[c]	16.1[d]
2	278.2[a]	282.4[b]	32.0[c]	19.8[d]
3	278.0[a]	281.0[b]	28.3[c]	19.7[d]
4	278.2[a]	281.5[b]	31.8[c]	23.3[d]
Mean	278.4[a]	282.5[b]	31.6[c]	19.7[d]

[a,b] Means for gestation length without a common superscript differ (P < 0.05).

[c,b] Means for temperature without a common superscript differ (P < 0.01).

In yr 5, when blood samples were obtained to measure progesterone, cows that calved in August had shorter gestations (275.2 ± 1.3 d, n = 14, P = 0.07) compared with cows that calved in October (278.8 ± 1.4 d, n = 10; Table 2). Maximum daily ambient temperature during the last 8 d of gestation was greater (P < 0.001) during August (36.3 C ± 4.5) than during October (25.2 C ± 7).

Effects of calving season on length of gestation of beef cows in yr 5.

Gestation, d		Max Ambient Temp at calving, ºC	
August	October	August	October
275.5 ± 1	278.8 ± 1	36.3 ± 4.5	25.2 ± 7

Month effect on gestation (P = 0.07).

Month effect on max ambient temperature (P < 0.001).

Concentrations of progesterone in plasma of August and October calving beef cows during late gestation were not different (P>0.4, Figure 1). Concentrations of progesterone were greater than 5.0 ng/mL during gestation and decreased to 1ng/mL at parturition. During 2 to 3 days before parturition, concentrations of progesterone decrease dramatically. Collection of blood samples

more frequently prior to calving may be necessary to evaluate the effect of elevated ambient temperature on concentrations of progesterone in plasma in late gestation.

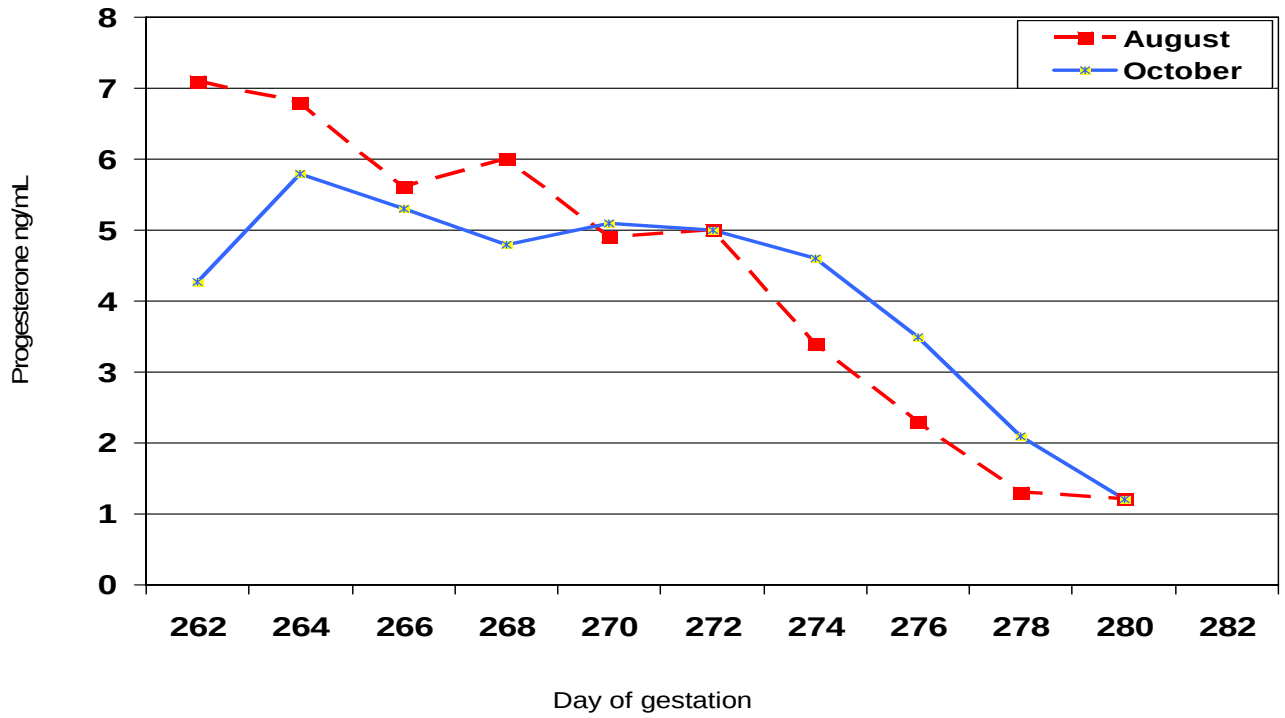

Figure 1. Concentration of progesterone in plasma of early and late fall calving beef cows during late gestation

Implications

Elevated ambient temperatures in late gestation induces early parturition in beef cows. Kastner et al. (2004) concluded that August calving cows in Oklahoma have a shorter gestation than October calving cows. Elevated ambient temperatures during late gestation may initiate parturition and influence survival and performance of calves.

Literature Cited

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Authors

Wright, Elane - Graduate Student

Prado-Cooper, Monica - Graduate Student

Long, Nathan - Graduate Student

Wettemann, R.P. Reagents Professor