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Winter Temperatures May Affect Calf Birth Weights

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Summary

A 3-year study was conducted to evaluate effects of high and low air temperatures and wind chills during winter months on subsequent calf birth weights and calving difficulty of spring-born calves. Records on approximately 400 2-year-old heifers and their calves were used. Heifer and calf genetics were the same each year. Heifers were fed similar quality hay ad libitum each year before calving. High temperatures during the 1994-95 winter were 9 degrees higher than during the 1992-93 winter. The low temperatures were five degrees higher for 1994-95 compared to 1992-93. The greatest differences in monthly temperatures between years were found during December, January and February. Average temperatures for these three months increased 11°F over the three years. Average calf birth weights decreased 11 pounds (81 to 70) from 1993 to 1995. A 1:1 ratio was observed. Although calving difficulty was high due to the

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research design, it also decreased from 57% to 35% from 1993 to 1995. Results indicate that cold temperatures influenced calf birth weight. Weather cannot be controlled; however, with below average winter temperatures, larger birth weight calves and more calving difficulty may be expected in the spring.

Introduction

Calving difficulty incurred by 2-year-old heifers is a major problem. Research has shown the basic cause is a disproportion between the calf size at birth (birth weight) and the heifer's birth canal (pelvic area). Several factors affect calf birth weight, including genetics of sire and dam, dam nutrition, calf sex and climatic conditions. Weather conditions may have a significant effect on calf birth weight. When a pregnant animal is exposed to cold temperatures, blood is concentrated internally to maintain its core body temperature. Therefore, during prolonged periods of cold weather, the fetus may receive more nutrition because more blood flows to the uterus. Research has shown that blood flow is the primary determinant of nutrient uptake by the uterus.

Calf birth weights have been found to be heavier in northern climates than in southern climates. Research has also shown that calves born in summer and fall have lower birth weights with less calving difficulty than those born in late winter and early spring. The objective of this research was to determine how changes in climatic temperatures and wind chill during winter months influence calf birth weights in the spring.

Procedure

A study was conducted at the University of Nebraska, West Central Research and Extension Center (WCREC), North Platte to evaluate the effects of high and low air temperatures and wind chill during the winter months of 1992-93, 1993-94 and 1994-95 on birth weight of calves and calving difficulty during the following spring. Approximately 400 2-year-old heifers from the Gudmundsen Sandhills Laboratory (GSL), which were on a calving difficulty study, were used for this research. Heifers were at GSL from October through December, then moved to North Platte in January for spring calving. Heifers were MARC II breeding each year and artificially inseminated as yearlings to the same four Angus sires. Two sires had low birth weight EPDs and two sires had high EPDs to study calving difficulty. (Results of this study will be reported next year.) The heifers were fed and managed similarly each year. They were on native range at GSL until January and then fed bromegrass hay ad libitum with alfalfa hay as a sup-ple-ment to meet NRC requirements at WCREC. Heifers had similar precalving body weights (968 $\pm$ 14 pounds), condition scores (5.1 $\pm$ .1), and pelvic sizes (244 $\pm$ 4 cm^2) each year.

Calving data included birth weight and date, calving difficulty, calf vigor plus five external measurements of the calves. The calving season lasted for 7 weeks each year from approximately February 9 to March 25. For the analysis, calf birth dates were divided into three 2-week periods. Period 1 included calf birth dates from February 9 to 22, Period 2 from February 23 to March 8, and Period 3 from March 9 to 25. Since only a few heifers calved during the seventh week, they were included with the sixth week.

Weather data were collected for three months (October, November, December) during 1992 to 1994 at the GSL weather station near Whitman and for three months (January, February, March) during 1993 to 1995 at the WCREC weather station near North Platte. Weather factors evaluated were high and low air temperatures and wind chill.

Data were analyzed by least squares analyses. High and low air temperatures and wind chill temperatures had main effects of month and year. Calf birth weights were analyzed by week, month and year with calf sire and sex removed. Calving difficulty percentages were tested by Chi-square analysis.

Table 1. Average high temperatures (ºF) by month over the three winters

Month	Winter of 1992-93	Winter of 1993-94	Winter of 1994-95
October	49^a	48^a	62^b
November	42^a	42^a	47^b
December	33^a	41^b	44^b
January	30^a	35^a	41^b
February	31^a	35^a	49^b
March	50^a	59^b	51^a
Average	39^a	44^b	48^c

abcRows with unlike superscripts differ (P < .10).

Table 2. Average low temperatures (ºF) by month over the three winters

Month	Winter of 1992-93	Winter of 1993-94	Winter of 1994-95
October	33^a	14^b	26^a
November	19^{ab}	16^b	23^a
December	10^a	19^b	17^b
January	8^a	13^b	13^b
February	6^a	12^b	19^c
March	25	24	25
Average	16^a	18^b	21^c

abcRows with unlike superscripts differ (P < .10).

Results and Discussion

The high monthly temperatures for the three winters are shown in Table 1. Temperatures tended to increase from 1992-93 to 1994-95. The largest differences (P < .10) were between the winters of 1992-93 and 1994-95. The average high temperatures by winter period were 39, 44 and 48 ºF for 1992-93, 1993-94 and 1994-95, respectively. Table 2 shows the low monthly temperatures for the three winters. As with the high temperatures, a trend existed for the low temperatures to increase from the first winter to the last. For the average low temperatures, the greatest differences (P < .10) were between the 1992-93 and 1994-95 winters.

After analyzing the temperature data, the greatest differences were found for the months of December, January and February, so the wind chill data were only analyzed for these three months. The average of the high and low air temperatures and wind chill for

Table 3. Average temperatures and wind chills (F°) by months over the three winters

Winters	December	January	February	Average difference
Avg. temperature				
1992-93	22[a]	19[a]	19[a]	
1993-94	30[b]	24[b]	23[a]	
1994-95	31[b]	27[b]	34[b]	
Largest difference[c]	+9	+8	+15	+11
Wind chill				
1992-93	12[a]	12[a]	13[a]	
1993-94	19[b]	17[a]	19[a]	
1994-95	21[b]	21[b]	26[b]	
Largest difference[c]	+9	+9	+13	+10

[ab]Columns within category with unlike superscripts differ (P < .10).
[c]Largest differences each month were between winters of 1992-93 and 1994-95.

Table 4. Calf birth weights and calving difficulty by 2-week calving periods over 3 years

Years	No. calves	Two-week calving periods[d] 1	2	3	Average difference
Calf birth weight (lbs)					
1993	138	79[a]	80[a]	85[a]	
1994	134	75[a]	76[b]	77[b]	
1995	112	69[b]	70[c]	73[b]	
Largest difference[e]		-10	-10	-12	-11
Calving difficulty (%)					
1993	138	49[a]	52[a]	77[a]	
1994	134	48[a]	51[a]	50[b]	
1995	112	24[b]	31[b]	55[b]	
Largest difference[e]		-25	-21	-22	-22

[abc]Columns within category with unlike superscripts differ (P < .10).
[d]Calving periods were: 1 - Feb. 9 to 22; 2 - Feb. 23 to Mar. 8; 3 - Mar. 9 to 25.
[e]Largest differences each calving period were between years 1993 and 1995.

the three months are shown in Table 3. The largest differences (P < .10) were between the winters of 1992-93 and 1994-95 for each month. During December, the average temperature was nine degrees higher for the last winter compared to the first, with eight °F difference in January and 15 °F in February. The overall increase in temperatures was 11°F between the two winters. Wind chills were also considerably different (P < .10) between the two winters for each of the months. The winter of 1994-95 was quite warm compared to the winter of 1992-93 with an overall higher wind chill temperature of 10 °F. This difference in temperature was obvious to most beef producers as they described the winter of 1992-93 as severely cold compared to that of 1994-95 as quite mild.

Calf birth weights by 2-week periods for the three years are shown in Table 4. Significant differences (P < .10) were found between 1993 and 1995 for each period, with birth weights decreasing an average of 11 lb (81 versus 70 pounds, respectively). Percentage of calving difficulty is also shown in Table 4. There were significant differences (P < .10) between 1993 and 1995 for each calving period, with an average decrease of 22%. Beef producers in Nebraska also reported having greater calving difficulty in 1993 compared to 1995 due to several reasons including larger calves.

This research helps explain the changes in calf birth weight and calving difficulty experienced by beef producers over various years. Our data showed calf birth weights were an average of 11 lb lighter in 1995 compared to 1993, along with a decrease of 22% in calving difficulty, while average air temperatures and wind chills were 10 to 11 degrees warmer in 1995. These data show a 1:1 ratio between the changes in temperature and calf birth weights. Therefore, these results support the theory that weather conditions do affect calf birth weights. Heifers do consume more hay during colder temperatures which can increase nutrients to the fetus; however, research indicates calf birth weights may change only a couple of pounds. Increased blood flow to the uterus due to cold temperatures is thought to be the major factor increasing fetal growth.

It appears from this data set that the months of December, January and February (which had the coldest temperatures) had the greatest affect on fetal growth. Calf birth weights each year were heavier at the end of the calving season compared to the beginning (Table 4). This may indicate that heifers that calved in February endured a shorter period of cold temperatures and had lighter calves than heifers calving in March.

Other factors which could have influenced heavier calves in March would be longer gestation lengths, more male calves, and/or a higher level of nutrition to the heifers. Average calf gestation length was not different between the calving periods. Also, the influence of calf sex was removed by statistical analysis. Heifers calving in March had a slightly longer precalving feeding period, but the effects on calf birth weight would have been small.

More research is needed to confirm these findings. However, if a cold winter is experienced, producers may expect heavier calves at birth and more calving difficulty. Providing wind protection or shelter to heifers during the winter would reduce the wind chill effects and may be beneficial at calving.

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