



After an unusually mild early winter in the Northeast, the temperatures from January to April were much colder than average and larger birth weights were observed in many cows calving during April and May. One Northeastern Hereford breeder's cows, including the female pictured, had an average birth weight 4 lb. higher than the previous five-year average. However, no increase in dystocia was noted and calf survival rate remained unchanged.

The Truth about Temperature, Birth Weight

The facts concerning how cold weather can affect calf birth weights.

by *Megan Galloway*

Bright flowers, warm temperatures and green pastures are all signs of spring that encourage cattlemen across the country to believe the long, bleak days of winter are at an end. For many, the start of

spring also brings the excitement and sleepless nights of calving season. However, during years of more intense cold, producers often find themselves dealing with heavier calf birth weights and consequently increases in dystocia.

Glenn Selk, Oklahoma State University (OSU) Extension animal reproduction specialist, is quite familiar with this phenomenon. "For years I've heard veterinarians and producers think there was a relation between increased spring calf birth weights and colder winters," Selk says. "How big and how important the correlation remains up for debate."

Scientific support

Since birth weight has been shown to be the primary cause of calving difficulty, understanding the strength of and reasons for this correlation is important to researchers and breeders alike. Studies have proven genetic heritability of birth weight to be about 45%, leaving 55% to be determined by environmental conditions. With environment able to play such a large role in determining calf birth weight, it's important for producers to be aware of how different variables, such as temperature, can affect their upcoming calving season.

Unfortunately, research on the temperature/birth weight relationship has been limited since, no matter how good the research center, weather is not something scientists can manipulate. Because of this lack of control, it's impossible to have a control group of animals living within the same parameters during a study involving temperature effects.

University of Nebraska researchers led by Gene Deutscher, Dave Colburn and Rex Davis managed to do the next best thing by monitoring birth weights of genetically similar calves across six different winters from 1992 to 1998. The study, conducted at the West Central Research and Extension Center in N. Platte, Neb., utilized 2-year-old females bred to the same calving-ease sire. The females were maintained on a diet of free choice hay and calved between mid-February and the first of April. Throughout the study, researchers gathered high and low air temperatures as well as

wind chills during the months of December, January and February.

The data collected during those six winters related average winter temperatures to calf birth weights and discovered an approximately 1:1 ratio between average temperature change and birth weight. For example, the winter of 1992-93 was the coldest and was 11 degrees colder than the warmest winter, 1994-95. Calves born in the spring of 1993 were an average of 11 lb. heavier at birth than calves born in the spring of 1995.

Calving difficulties also fluctuated noticeably in accordance with birth weight changes. Researchers noted a 29% greater incidence of calving difficulty during 1993 as opposed to 1995.

According to Selk, the results clearly indicate a strong correlation between winter temperatures and calf birth weights. With every one-degree temperature decrease in average or wind chill temperature, birth weight increased 1 lb. and calving difficulty increased 2.6%.

John Hall, Virginia Tech University Extension animal scientist, highlights an important fact from the Nebraska study. The winter of 1995-96 did not seem to support the results, as temperatures were relatively warm but calf weights and dystocia actually increased. Upon review, researchers observed the month of January was much colder than average and concluded this one cold month late in gestation was enough to affect birth weight.

This was the case for many Eastern breeders last winter. After a fairly mild start, the winter weather blew in a number of storms and very low temperatures from February onward. As a result, Hall says he received a number of calls about heavier calves this spring. "A predominant amount of fetal growth occurs during the last trimester," Hall says. "So anything that happens during that time has an increased effect."

Warmer weather, lighter birth weights

Despite the limited data to support cold weather correlations with increased birth weights, Selk says that more evidence is available on the opposite end of the spectrum. Various research projects have shown a strong relationship between warmer temperatures and lower calf birth weights. He specifically cites a 1990 OSU study that compared fall-born calves and spring-born calves out of crossbred cows and the same bulls. Selk says the results indicated the fall-borns were 4.5 lb. lighter at birth than the spring-borns. Since the fall-calving cows gestated during a warmer part of the year, this information again supports the theory that

Table 1: Effects of winter temperatures over six years on calf birth weight and calving difficulty.

Winter	Average temperatures ^a (°F)	Average wind chill ^b (°F)	Number of calves	Calf BWT ^c (pounds)	Calving difficulty ^d (%)
1992-93 (coldest)	20	12	36	77.6 ^e	58 ^e
1993-94	26	18	39	72.5 ^f	33 ^{fg}
1995-96	27	19	44	75.2 ^{ef}	45 ^{eg}
1996-97	27	20	76	72.4 ^f	30 ^{fg}
1997-98	30	22	59	67.4 ^g	25 ^f
1994-95 (warmest)	31	23	31	66.4 ^g	29 ^{fg}
Difference coldest to warmest	11	11		11	29

^a Winters ranked from coldest to warmest. High and low temperatures for December, January and February were averaged.

^b Average wind speed × average temperature for three months.

^c Birth weight adjusted for calf sex.

^d Calving difficulty with scores 3 to 5 on a 1 to 5 scoring system.

^{efg} Means within category differ (P < .05).

(Deutscher, et al., 1999)

If the big calves are causing problems, Hall recommends using more calving-ease sires so that, even if temperatures lead to higher birth weights, the calves will still be born easier.



John Hall

variable ambient temperature does affect birth weight.

These results are also evident in the real world according to Hereford breeder Curtis Curry of McAlester, Okla. The family-run seedstock operation, Curry Herefords, calves about 25% in the fall and approximately 75% in the spring. Curry says he has consistently found his fall calves tend to be smaller than this spring-borns. "We haven't assisted a single fall-calving heifer for over three years now," Curry says. And he's also seen a variation in his spring calves depending on the temperatures during their final trimester. "On average, the calves born prior to our coldest month, February, tend to be lighter than those born later in the spring," Curry says.

Possible explanations

Of the various explanations for this phenomenon, Selk says the most credible theory at this point involves the changing blood flow patterns of cows gestating in hot weather versus cold weather. Blood is shunted away from internal organs toward the outer extremities during hot weather in order to dissipate heat and cool the animal. Cold weather produces the opposite effect as blood is directed toward the internal organs to conserve heat and maintain body temperature.

Hall says this changing blood flow pattern may result in greater blood flow and, therefore, more nutrients to the fetus. More nutrients logically translate into more growth, and scientists theorize this change in maternal blood flow may affect fetal growth in a small way but lead to a measurable difference. This theory would explain why producers see heavier birth weight calves and more calving problems after cold winters even though genetics and management remain very similar.

Feed has long been blamed for major increases in calf birth weights. Although, Hall says, the theory that voluntary feed intake increases in cows exposed to cold may be accurate, it appears to have only a minor effect on birth weight.

A more recent explanation has arisen from metabolic changes in cold-stressed ewes, according

to Hall. These metabolic changes lead to an increased availability of glucose and two insulin-like growth factors (IGF) that are important regulators of fetal growth. Other studies of females gestating in colder temperatures have shown increased brown adipose tissue, the fat used to produce heat during the first days of life, in newborns. Hall explains that these changes, along with the corresponding increase in size, are positively correlated to newborn calf survivability and appear to be nature's way of preparing calves for the rigors of harsher weather.

Dealing with the weather

Not even a weatherman can accurately predict the weather on a consistent basis, and unfortunately, producers don't have a thermostat to adjust winter temperatures to more bearable levels. So when it comes to temperature effects on calf birth weights, producers simply must control the controllable.

For those who live in a climate that will allow it, Selk suggests eliminating the worries about cold weather by doing away with spring calving altogether. "In the Southern Plains region, so many things just seem to go better with fall calving," Selk says. "We see less scours, lower birth weights, less situations with cattle congregated and an overall drier, cleaner environment for young calves."

He also notes the benefits for the cows: better body condition, higher percentage cycling and a larger breeding percentage. And for those commercial operations that can handle a fall-calving season, the 10-year average has shown prices are 5% higher for the same calf in July as compared to October.

Of course, fall calving isn't an option for everyone, and spring calving troubles can be reduced with a variety of management techniques. Windbreaks and other protective structures are a good way to keep cattle a little warmer during the cold months. However, their effect will be minimal, and Hall advises other more effective management solutions. But

before putting a lot of effort into correcting the issue, he suggests producers consider whether those larger weights are translating into more calving difficulties since moderately higher birth weights may lead to more vigorous, growthy calves without causing increased dystocia.

If the big calves are causing problems, Hall recommends using more calving-ease sires so that, even if temperatures lead to higher birth weights, the calves will still be born easier. Through artificial insemination and expected progeny differences, Hall believes breeders have the opportunity to use high-quality, proven bulls without ever owning one. He also encourages synchronization of heifers to shorten the calving season and allow producers to be more attentive to their first-calf heifers.

Selk notes that pelvic size in heifers is an additional selection tool to consider when attempting

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to decrease calving problems. Additionally, he emphasizes the importance of developing heifers properly to ensure they reach their full growth potential and are in adequate condition to withstand the rigors of calving.

Despite a rancher's best efforts, Selk and Hall agree that heavier spring birth weights are still going to be more prevalent during cold winters and the No. 1 thing producers can do is simply to be more vigilant during calving season. "As long as calves are delivered successfully," Hall says, "weighing a little bit more can be a good thing for survivability and profitability." **HW**

Nutritional effect

Although feed is frequently blamed for heavier birth weights and increased dystocia, Oklahoma State University (OSU) Extension Animal Reproduction Specialist Glenn Selk says research indicates minimal increases of 1-3 lb. in calf birth weight as a result of nutritional changes. "Within normal ranges of what we work with, we really don't see the shift in birth weight based on feed

changes that is the common thought," Selk says. He also points to the fact that although fall-calving cows are often in better body condition at calving, they tend to have lower birth weight calves.

One of the issues Selk finds himself dealing with is an old misconception that feeding heifers less, especially during their final months of gestation, will result in smaller calves and less dystocia. Selk says not only is this theory false but it can actually have a number of negative effects. "Cutting back feed to replacement heifers winds up costing producers," he says. "Research has shown that we must have heifers extremely thin to reduce birth weight."

Once heifers are thin enough to lower calf weights, a number of other harmful side effects come into play that far outweigh the decrease in pounds of calf according to Selk. Thin heifers are in a much weaker state at calving, milk flow is often reduced, colostrum is of lower quality and rebreeding will take longer. To add to that, calves of very thin heifers will be weaker and less vigorous at birth, conditions that could create more survivability issues.

Glenn Selk

Of course, Selk isn't supportive of getting heifers excessively fat prior to calving either. Females in the upper range of body condition are going to have problems, including more fat in the birth canal that could contribute to dystocia and reduced milk flow caused by high amounts of udder fat.

Selk's optimum body condition score for a 2-year-old at calving time is a 6 — a narrow window, but one that will ensure young females have the best chance to become productive members of the cow herd. Adult cows can be slightly thinner, approximately a 5.5 BCS, since they are no longer growing and have slightly lower nutritional demands postcalving.

The main point Selk stresses is that heifers need to be fed to reach their optimal growth potential. He encourages producers with questions about what to feed to contact their Extension beef nutritionists.

"Producers really shouldn't worry so much about how feeds are going to impact their calving season since there is a lot of data to support the fact that feed really doesn't impact dystocia rates," he says. "By taking good care of 2-year-olds, we're not going to increase dystocia." **HW**

Heifers need to be fed to reach their optimal growth potential.