Genetic Roadblocks

Genetics affect calving intervals in young Angus females.

by ***American Angus Association staff***

What is the correct definition of reproductive efficiency? There may not be a single answer that satisfies all aspects of this question. However, most producers say they want three things from every replacement female they select for their herds. First, she must readily breed as a yearling heifer and produce a calf by the time she reaches 24 months of age. Next, she must cycle and rebreed quickly, maintaining a 365-day calving interval year after year without interruption. She also needs longevity. A decade or so in the herd is desirable, consistently rebreeding and calving on time, until she's finally sold as an aged cow.

Reproductive efficiency is actually easy to describe. Turning that vision into reality is altogether another matter, especially considering the nutritional, weather and health challenges the average beef cow faces in her reproductive lifetime. From freezing cold to searing heat, insects and unfriendly microorganisms, plus a wide variation in both the quality and quantity of available feedstuffs — the beef cow must deal with a full gamut of challenges. And, the tough times often hit before she has even reached maturity.

Getting young females established in the herd is usually a cow-calf producer's most difficult task. Those 2- and 3-year-old cows must clear desired reproductive hurdles, while still growing and developing themselves. Many simply don't make it.

Commercial cow-calf data compiled through the North Dakota State University Cow Herd Appraisal Performance Software (CHAPS) program indicates that 25% of all young cows calving with their first calf at 2 years of age will be removed from the herd by age 4. One-third are culled before they reach age 5. Reproductive failure is the main reason for such a high dropout rate, and that really hurts the pocketbook. The cost of raising or purchasing a replacement female is substantial.

It's not uncommon to see extended calving intervals (390-420 days) among 2- and 3-year-olds. And, that makes some young cows particularly vulnerable the following year when they calve late in the calving season and may not have time to cycle and rebreed before the bulls are pulled from the breeding pasture.

Genetics play an important role

Providing suitable nutrition is a requisite to helping young cows deal with the obstacles Mother Nature dishes out. It's also important to understand the genetic influences that may work for — or against — their reproductive success.

Recent research on calving intervals in young Angus females reveals that genetics do have a measurable, cause-effect influence on reproductive performance. Expected progeny difference (EPD) variations in milk, yearling weight and ultrasound fat were all found to affect calving interval length both between the first and second calf (first-second calving interval) and between the second and third calf (second-third calving interval).

Cow energy requirements, as captured by Cow Energy Value ($EN), can also be influential. Based on complete calving records from nearly 120,000 Angus females aged 2 to 4 years [Angus Herd Improvement Records (AHIR) dams born from 1995 through 2001], this research tells an interesting, though not unexpected, story. Trait-by-trait results are outlined below.

Milk EPD. Lactation must be supported by significant amounts of feed energy and increased nutritional protein. Young females with higher milk EPDs need more feed to meet their bodies' nutritional requirements. With those facts in mind, it's not surprising that higher milk EPDs are associated with longer calving intervals (P<0.01). American Angus Association data quantifies this relationship as follows:

- ► Each 10-pound (lb.) increase in milk EPD = +1.8 days in first-second calving interval
- ► Each 10-lb. increase in milk EPD = +1.4 days in second-third calving interval

This relationship tells us that (in a typical farm or ranch environment) an Angus female with a milk EPD of +30 lb. will usually take about two days longer to breed back after calving with her first calf compared to a similar female with a +20 milk EPD. After her second calf is born, the higher-milk female will again take slightly longer to cycle and rebreed. Because the relationship is linear, the same calving interval differences would be expected between an Angus female with a +20 milk EPD and another Angus female with a milk EPD of +10 lb. The lower-milk-EPD female would tend to have shorter calving intervals.

Yearling weight EPD (YW EPD). There is a strong correlation between YW EPD and mature cow size. Angus females with higher YW EPDs tend to have larger mature sizes, so they are growing faster as 2- and 3-year-old females compared to same-age cows with lower YW EPDs. Supporting this faster growth can be a challenge, which is the likely reason slightly longer calving intervals are observed in higher YW females.

As with milk, this relationship was found to be statistically significant (P<0.01). Interestingly, there was no difference between the effect of a 10-lb. increase in YW EPD on the first-second vs. the second-third calving interval. Both exhibited almost exactly the same relationship, as presented below:

- ► Each 10-lb. increase in YW EPD = +0.5 days in first-second calving interval
- ► Each 10-lb. increase in YW EPD = +0.6 days in second-third calving interval

Higher-growth females will tend to have slightly longer calving intervals. And again, the relationship is linear, so a 20-lb. difference in YW EPD will usually result in a 1.0- to 1.2-day increase in the first-second and second-third calving intervals, respectively (two times the amount shown above, corresponding to twice the difference in YW EPD).

From a practical standpoint, these are not large differences. But, it is clear that reproductive performance is influenced by the amount of physical size a young female is genetically programmed to attain as she grows toward maturity.

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Ultrasound fat EPD (UFAT EPD). Very much as expected, young females that more readily attain backfat have a modest advantage when it comes to reproductive performance during their early years in the cow herd. The Association's analysis revealed a small but statistically significant effect ($P<0.02$) of UFAT EPD on both first-second and second-third calving intervals.

For example, if we compare females in the fattest 15% of the breed for UFAT (group average UFAT = +0.015) to those in the leanest 15% (group average UFAT = –0.013), the high-fat females are found to exhibit shorter calving intervals. This difference amounts to 0.7 and 0.6 days for the first-second and second-third calving intervals, respectively.

Other factors equal, the genetic effect between these two UFAT female groups would total 1.3 days (0.7 + 0.6) from the first to third calf. It's a small difference, yes, but not insignificant in the message it communicates.

Cow energy value ($EN). Because it represents metabolic cow size, $EN can also be shown to affect calving intervals in young Angus females, as presented below:

- Each $10 increase in $EN = –2.3 days in first-second calving interval
- Each $10 increase in $EN = –2.0 days in second-third calving interval

Higher $EN values are associated with cows requiring less total feed energy (those with lower milk and growth genetics). Analysis of Association calving records indicates that lower feed requirements shorten rebreeding time, resulting in shorter average calving intervals ($P<0.01$).

This effect is *not* independent of the milk and YW EPD influences discussed above. $EN is calculated based upon the milk and mature size genetics an animal possesses. Therefore, measuring the $EN effect on calving interval is like looking from a different vantage point at how milk and YW EPDs affect reproductive performance. These two perspectives tell the same basic story: high-milk and high-growth genetics can be antagonistic with reproductive performance.

Non-influential EPDs. Several other EPDs were reviewed as part of this analysis, but they did not exert a measurable influence on Angus calving intervals. These include ultrasound ribeye area (URE), carcass fat thickness (FAT) and sire's scrotal circumference (SC).

The adage still applies

Maintaining a high level of reproductive efficiency in young cows is a tall order for almost everyone in the cow-calf business, regardless of their resource base. Herd nutrition and health programs must be adequately focused on keeping 2- and 3-year-olds in good to excellent flesh condition on a year-round basis.

It's also critical that genetic profiles for milk and growth are appropriate for the farm or ranch environment where a group of cows is being asked to perform.

"Breeders over time have witnessed the consequences of selection for extremes, where milk and growth levels became out of line with their production environments and the results were problematic," says Sally Northcutt, Association genetic research director. "Milk and growth are economically valuable traits, but balancing these traits with efficient reproduction should be a key target for every cow-calf producer in the country."

The adage about the importance of matching the cow to the environment still applies — even in the modern era of 21st-century beef production.

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