



BEEF CATTLE RESEARCH UPDATE

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Genetics of Reproductive Performance in Beef cows and its Association with Performance Traits

Reproduction is the most economically important factor in the efficiency and profitability of most cow-calf operations. Researchers in Ireland used records from 156,056 beef cows to estimate genetic parameters for reproductive performance in beef herds.¹ Genetic correlations between reproductive traits and performance traits were also estimated. All of the cows were of *Bos taurus* breeding and the majority of the cows were crossbreds. The reproductive traits evaluated were age at first calving, cows calving in the first 42 days of the calving seasons (Did cows calf in the first 42 days? yes or no), calving interval between consecutive calving events, and survival to the next lactation. Performance traits that were measured included calving dystocia, linear type traits (describing the skeletal, muscular, and functional characteristics of an animal), live weight and price, carcass traits, and producer subjectively scored traits of weanling quality and docility.

These researchers reported that heritability for age at first calving was 0.31 while the heritability of the remaining reproductive traits ranged from 0.01 to 0.06. The heritability of dystocia was 0.35. The heritability of the linear type traits were generally moderate ranging from 0.09 to 0.38 for skeletal traits and from 0.27 to 0.32 for muscular traits. The heritability of weaning weight, postweaning weight, and carcass weight were 0.27, 0.43, and 0.82, respectively.² Other research has shown that in general, heritability estimates of reproductive traits in cattle are low.³ As a rule of thumb, most reproductive traits tend to have low heritability (<0.20), growth traits tend to have moderate heritability (0.20 to 0.40), and carcass traits tend to have fairly high heritability (>0.40).⁴ These authors noted that age at first calving is more highly heritable since it would be associated with growth rate or weight.

This research showed that animals genetically predisposed to calving for the first time at an older age had inferior genetic merit for calving interval (longer intervals). Genetic merit for calving interval was an important contributor to the genetic differences in survival (cows with shorter calving intervals stay in the herd longer). Genetically taller, longer, and wider animals were of inferior genetic merit for reproductive performance. Greater genetic merit for increased muscularity was genetically correlated with reduced number of animals calving in the first 42 days of the calving season and longer calving intervals. These authors concluded that because of the unfavorable genetic correlation between muscularity and reproductive performance that producers with breeding goals that select for muscularity, live weight, or growth rate need to be aware of reproductive performance, or at least some indicator of reproductive performance (Body Condition Score), to minimize any deterioration in the reproductive performance of the of the selection line, breed, or population.

Relationship between Feed Efficiency Traits and Fertility in Young Beef Bulls

Since feed is the most expensive input within any livestock production system, feed efficiency has a tremendous influence on the cost of production. Although feed costs are a major factor influencing the profitability of beef production, successful reproduction in the

cow-calf sector is the primary driver affecting profitability. The number and percentage of cows successfully bred during the breeding season is a major factor influencing the profitability of the cow/calf operation. Hence, bull fertility plays a key role in the success of calf production.

Recent Canadian research at the University of Guelph examined the relationship between feed efficiency traits and bull fertility traits (sperm motility, viability and scrotal circumference).⁵ Feed efficiency was measured as residual feed intake (RFI) in this study. RFI is defined as the difference between an animal's actual feed intake and its expected intake based on body weight and growth rate. Positive RFI animals eat more than expected in relation to their weight and gain, so they are less efficient. A negative RFI value is better and indicates a more efficient animal.

In this study, 110 crossbred beef bulls were selected for semen collection from a total of 328 bulls based on their desirability for use in the University of Guelph breeding herd over a 6-year period (2002 - 2007). All of the bulls were subjected to a performance test (112 days) in which individual feed intakes were measured. The average age of the bulls at the start of the performance test was 274 days with average initial and final weights of 796 and 1246 lb, respectively. At the end of the test, scrotal circumference was measured and semen was collected.

These researchers reported that the 10 bulls with the greatest feed efficiency (low RFI) showed decreased sperm motility, viability, and scrotal circumference compared to the 10 least efficient bulls (high RFI). Thus, these data suggest that low RFI bull are less fertile than high RFI bull. These authors concluded that this undesirable effect of selection for improved feed efficiency needs to be addressed through multiple trait selection.

¹ Berry, D. P. and R. D. Evans. 2014. Genetics of reproductive performance in seasonal calving beef cows and its association with performance traits. *J. Anim. Sci.* 92:1412-1422.

² Hugh, N. M., R. D. Evans, A. G. Fahey, and D. P. Berry. 2012. Animal muscularity and size are genetically correlated with animal live-weight and price. *Livest. Sci.* 144:11-19.

³ Cammack, K. M., M. G. Thomas, and R. M. Enns. 2009. Review: Reproductive traits and their heritabilities in beef cattle. *Prof. Anim. Sci.* 25:517-528.

⁴ Johnson, M., D. Stein, D. Buchanan, and S. Northcutt. 2008. Beef cattle breeding. In: *Oklahoma Beef Cattle Manual Sixth Edition*, Oklahoma Cooperative Extension Service. p. 179-204.

⁵ Awda, B. J., S. P. Miller, Y. R. Montanholi, G. V. Voort, T. Caldwell, M. M. Buhr, and K. C. Swanson. 2013. The relationship between feed efficiency traits and fertility in young beef bulls. *Can. J. Anim. Sci.* 93:185-192.

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