BEEF CATTLE RESEARCH UPDATE

Britt Hicks, Ph.D., PAS
Area Extension Livestock Specialist
Oklahoma Panhandle Research & Extension Center

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Does Increased Milk Production in Beef Cows Increase Cow-Calf Productivity?

A major focus in the beef industry has been to maximize profit by using trait selection through the use of expected progeny differences (EPD). Milk production EPDs in most breeds (including Hereford and Angus) has consistently increased since the 1990s while a few breeds' genetic trend is negative or static (Figure 1).[1] Breeds with a negative or static genetic trend including Gelbvieh and Simmental had a relatively high capacity for milk yield when they entered the US beef industry. Selection for increased milk production should result in increased weaning weights. However, this also results in an increase in cow maintenance energy requirements, increasing the cost of feed to maintain cows with greater milk production. Although milk selection traits may increase production by increasing calf weaning weight, the additional cost to maintain production goals with increased milk production may decrease profitability. For this reason, University of Tennessee researchers evaluated the effects of actual milk yield in mature beefs cows on reproductive performance and calf performance in the Southeastern US in a high feed resource available environment.[2]

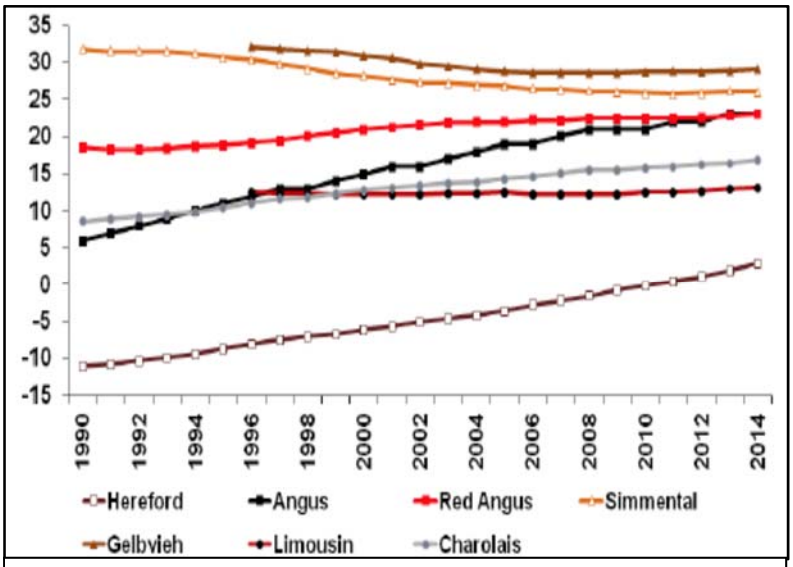

Figure 1. Relative genetic trends for maternal milk production (lb) of the seven most highly used beef breeds adjusted for birth year 2014 using the 2016 across-breed EPD adjustment factors. Source: Kuehn and Thallman, 2016.

This was a two year study using 237 spring-calving Angus and Angus crossbred cows (3 to 9 years old averaging 1368 lb) at three research stations in Tennessee. The pre-dominate forage of the pastures at these stations was endophyte-infected tall fescue. Depending on location, management practices varied. From December to May in each year, cows were fed ad libitum corn silage (9% CP and 65.2% TDN) at one station, rye haylage (8% CP and 58.6% TDN) with 5% corn distillers grain at a second station, and orchard grass hay (17% CP and 55.2% TDN) at the third station. Calves were born in January and early February (average of January 26th).

Approximately 30 days after calving, cows were weighed and visually appraised for body condition score (BCS) weekly until the end of the breeding season. Calf body weight (BW) was determined at birth, day 58 and at weaning. On approximately days 58 and 129 after calving, 24-hour milk production was measured with a modified weigh-suckle-weigh technique using a milking machine. The milk yield data was used to retrospectively classify cows on actual milk yield as Low (<17.6 lb/day, average = 14.5 lb; 74 cows), Mod (17.6 – 22.0 lb/day, average = 19.9 lb; 71 cows), or High (≥ 22 lb/day, average = 26.4 lb; 92 cows).

In April of each year, cows were synchronized and timed artificially inseminated (AI). Fourteen days after timed-AI occurred, cleanup bulls were placed with the cows in each location in a 60 day

breeding season. Pregnancy diagnosis was determined 30 days after timed-AI with an overall pregnancy diagnosis in September.

These researchers reported that due to retrospective designed treatments, 24-hour milk yield was different (P < 0.05, Table 1) among treatment groups at both milking dates (days 58 and 129). However, level of milk production did interact with milking date (P < 0.01). Milk production did not decrease (P ≥ 0.10) from day 58 to day 129 for Low and Mod milking cows, whereas, high milk cows decreased (P < 0.01) milk production from day 59 to day 128.

Table 1. Level of milk production x milking date interaction (P ≤0.01) for 24-hour milk production.

	Milk Production[1]		
Measurement	Low	Mod	High
24-hour milk production, lb			
Day 58	15.0^{ax}	19.6^{bx}	28.0^{cx}
Day 129	13.2^{ax}	19.4^{bx}	24.3^{cy}

[1]Milk production groups: Low (14.5 lb), Mod (19.9 lb), or High (26.4 lb).
^{a,b,c} Means with different superscripts differ among milk production groups (P ≤ 0.05).
^{x,y} Means with different superscripts differ between timing of milking (P ≤ 0.05).
Adapted from Edwards, Hobbs, and Mulliniks (2017).

The effects of milk production on cow performance, and calf performance are shown in Table 2. Cow BW and BCS during the entire study were not different (P > 0.22) with increasing milk production. Although cow BW and BCS were not different, timed-AI pregnancy rate were the lowest (P < 0.05) in the High (44%) milk producing cows with no difference (P = 0.82) between Low (57%) and Mod (55%) milk cows. In addition, overall pregnancy rate continued to be the lowest (P < 0.05) in High (75%) milk producing cows with the greatest pregnancy rate in Mod (86%) milk cows. Calf BW at birth did not differ among milk production groups.

Table 2. Effect of milk production level on cow BW, BCS, AI and final pregnancy rate and calf BW.

	Milk Production[1]			
Measurement	Low	Mod	High	P-value
Cow BW, lb				
Calving	1424	1372	1358	0.22
Beginning of breeding	1360	1312	1305	0.36
End of breeding	1429	1376	1367	0.25
Cow BCS				
Calving	5.2	5.2	5.2	0.99
Breeding	5.0	5.0	5.1	0.96
End of breeding	5.4	5.3	5.5	0.23
Reproduction				
AI pregnancy rate, %	57^{a}	55^{a}	44^{b}	0.02
Final pregnancy rate, %[2]	81^{a}	86^{b}	75^{c}	0.03
Calf BW, lb				
Birth	78.7	77.8	80.3	0.28
~Day 58	256^{a}	276^{b}	282^{b}	<0.01
Actual weaning	628	648	650	0.22
205 day adjusted[3]	595	613	615	0.55
lb weaned per cow exposed[4]	512^{a}	551^{b}	490^{c}	0.02

^{a,b,c} Means with different superscripts differ (P ≤ 0.05).
[1]Milk production groups: Low (14.5 lb), Mod (19.9 lb), or High (26.4 lb).
[2]Final pregnancy rate after a 60 day breeding season with cleanup bulls.
[3]Weaning weight adjusted to 205 day of age using Beef Improvement Federation adjustments without age of dam or calf sex.
[4]Based on the subsequent year's actual (unadjusted) calf weaning BW and percentage of exposed cows to a breeding bull during the year of the study.
Adapted from Edwards, Hobbs, and Mulliniks (2017).

Calf BW at the initial milking (~ day 58) was increased ($P < 0.001$) in calves from Mod and High milking cows. However, calf BW at weaning and 205 day adjusted BW was not different ($P = 0.22$) among calves from different milk treatment groups. The pounds of calf weaned per cow exposed is a key indicator of efficiency in beef herds.[3] In this study, High milking cows had the least ($P < 0.05$) pounds of calf weaned per cow exposed (490 lb) with Mod milking cows having the greatest (551 lb). Low milk producing cows weaned more pounds of calf per cow exposed (512 lb, $P < 0.05$) than High milking cows.

These authors concluded that the results of this study suggest "that even in management systems that modify the grazing environments with harvested feedstuffs, high milk production decreases reproductive efficiency without increasing calf BW at weaning". Furthermore, they recommended that "producers may need to discount high milk producing cows and take into account the requirements for maintaining a greater amount of milk, and the negative influences associated with a greater milk yield".

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[1] Kuehn, L. A. and R. M. Thallman. 2016. Across-breed EPD tables for the year 2016 adjusted to breed differences for birth year of 2014. In: Beef Improvement Federation Annual Research Symposium and Convention, Manhattan, KS. p. 127-154.

[2] Edwards, S. R., J. D. Hobbs, and J. T. Mulliniks. 2017. High milk production decreases cow-calf productivity within a highly available feed resource environment. Transl. Anim. Sci. 1: 54-59.

[3] Ramsey, R., D. Doye, C. Ward, J. McGrann, L. Falconer, and S. Bevers. 2005. Factors affecting beef cow-herd costs, production, and profits. J. Agric. Appl. Econ. 37:91–99.