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Genetic Variation In Days To Onset Of Postpartum Ovarian Function For Cows Sired By High And Low Milk EPD Hereford And Angus Bulls

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Story in Brief

Genetic variation in the post-calving initiation of reproductive cycles was assessed using days to luteal activity as an indicator of initiation of estrous cycles. Mature cows (n=248) sired by high and low Milk EPD sires from the Hereford and Angus breeds were used. Days to luteal activity was determined through weekly sampling of blood for use in determination of progesterone levels. Differences between breeds and Milk EPD levels were determined for post-calving days to luteal activity and percentage of cows displaying luteal activity by 85 d post-calving. Heritability of days to luteal activity was estimated by evaluating the similarities among and between half-sib groups. There was very little evidence of an effect of Milk EPD level on either days to luteal activity or percentage cycling by 85 d post-calving. The heritability of days to luteal activity was estimated as .30, which is a moderate level of heritability and is higher than many reported estimates of heritability for other traits associated with reproduction. These results indicate that Milk EPD can be used without undue concern about adverse effects on reproductive performance, at least in conditions similar to those in this study. Additionally, the moderate level of heritability indicates that there is substantial genetic variation for post-calving days to luteal activity, which will be useful in development of comprehensive selection programs that include an emphasis on reproduction.

Key Words: Beef Cattle, Reproduction, Heritability, Milk EPD

Introduction

Reproductive performance is a major contributor to efficiency in a cow-calf enterprise. Genetic improvement of reproduction is difficult because the heritability of many traits associated with reproduction is low. In addition, improvement of other performance traits may have a correlated effect on reproductive performance. Accurate genetic assessment of reproductive performance is complicated by numerous environmental influences and the binomial nature of many important reproductive traits.

Recent interest in milk production of beef cows, as evaluated with the Milk Expected Progeny Difference (Milk EPD) has caused an interest in the nature of the relationship between Milk EPD and reproductive performance. Previous work has illustrated the effectiveness of the Milk EPD in predicting differences in weaning weight and milk production (Minick et al.,

1999; Rupert et al., 1999). Lower body condition score in high Milk EPD cows was also evident (Minick et al., 1999). This lower condition score in high Milk EPD cows might be expected to have a negative effect on reproductive performance but this has not been the case (Buchanan et al., 1997).

The objectives of this research were to determine the difference between high and low Milk EPD cows for days from calving to reestablishment of reproductive cycles (measured as days to first luteal activity) and to estimate the heritability of that trait.

Materials and Methods

Cows were part of an ongoing project conducted by Oklahoma State University at the Lake Carl Blackwell Experimental Range. Cows were produced through the mating of Angus and Hereford bulls that differed in Milk Expected Progeny Difference (Milk EPD) to Hereford-Angus and Hereford-Angus-Brahman cows to produce crossbred females. Bulls were selected to form four different groups (High Milk EPD Angus n=12, Low Milk EPD Angus n=10, High Milk EPD Hereford n=6, Low Milk EPD Hereford n=7). Cows, during this study, ranged in age from 5 to 9 yr old. They were managed under spring and fall calving systems that are typical of commercial beef cattle management systems. Pastures were either native range or Bermuda and cows were maintained in moderate body condition. They were provided with a protein supplement and hay during the winter months.

Data were collected on 248 lactating cows from the spring of 1997 through the fall of 1999. Calving period in the spring extended from early February to late April and from early September to late November in the fall.

Luteal activity of the cows was evaluated by progesterone levels using a solid-phase radioimmunoassay procedure. Blood samples were taken weekly on each cow beginning by 30 d post-calving. Blood sampling continued weekly on each individual cow until the cow showed evidence of luteal activity by having a concentration of progesterone of at least 1 ng/mL for two consecutive weeks. Days to luteal activity was then calculated for each cow by determining the number of days from calving to this second consecutive high progesterone level in the blood.

Data for comparisons between breed and Milk EPD groups were analyzed with a statistical model that included breed, Milk EPD level, sex of calf, year and season as fixed effects. All interactions among fixed effects were included in the model but were removed if they did not make a contribution ($P>.30$). Sire of cow and cow, nested within breed and Milk

EPD level, were included as random effects.

Heritability of days to luteal activity was estimated with a half-sib analysis. The mean days to luteal activity for each cow (across the 3 yr) was determined and subjected to a model that included breed, Milk EPD level, number of calves during the 3 yr and interactions. Half-sib groups were included in the model through the random effect of the sire of the cows.

Results and Discussion

The comparisons between breeds and Milk EPD levels are in Table 1. There were no significant differences between breed or Milk EPD level, or the interaction, for percentage cycling by 85 d post-calving. Breed affected ($P<.05$) days to luteal activity but Milk EPD level did not ($P>.30$). The interaction between breed and Milk EPD level was approaching significance ($P=.11$). The rank of the two Milk EPD level means switched between breeds for both traits. These results add to previous work (Buchanan et al., 1997), which showed little effect of Milk EPD level on reproduction. This minimal effect is despite substantial differences in calf weaning weight, milk production and cow body condition at weaning (Minick et al., 1999; Rupert et al., 1999). Milk EPD can be used effectively to predict differences in calf weaning weight. High Milk EPD might be expected to have a negative effect on reproduction, due to lower cow body condition. This adverse effect was not evident, at least for environmental circumstances similar to those described here.

The estimate of heritability of days to luteal activity was .30. This heritability was higher than those generally reported for other traits associated with cow reproduction. This may not be surprising since days to luteal activity is not subject to some of the environmental influences that would affect calving percentage or rebreeding interval. It is unlikely, except possibly in some elite herds, that post-calving days to luteal activity would be used as a tool for selection or culling. However, the fact that there is apparent genetic variability for this trait should be useful in development of comprehensive beef cattle selection programs that include reproductive performance in the selection objectives.

Literature Cited

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Table 1. Days to luteal activity and percentage cycling by 85 d post-calving least squares means for breed and Milk EPD level of mature cows sired by Angus and Hereford bulls.

	Milk EPD level	n	Days to luteal activity	Percentage cycling by d 85
Breed				
Angus	High	172	66.8	78.6
Angus	Low	195	64.3	81.0
Hereford	High	83	55.1	80.2
Hereford	Low	139	63.1	78.8
Standard error			3.0	4.9
Tests of significance				
Breed			.05	.92
Level			.39	.79
Breed x level			.11	.77

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