

Association between Cow Reproduction and Calf Preweaning Growth Traits and ELISA Sample-to-positive (S/P) Ratio Scores for Paratuberculosis in a Multi-breed Herd of Beef Cattle

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Introduction

Paratuberculosis is caused by *Mycobacterium avium* subspecies *paratuberculosis* (MAP). The disease remains in a subclinical stage for a number of years before animals show clinical signs of diarrhea, weight loss, lower milk production, and eventually death. The serum ELISA test is a commonly used method to detect subclinical paratuberculosis; it is a serological test that detects antibodies to MAP in the serum of exposed animals. The ELISA is primarily used as a herd-screening tool that can detect approximately 50% of infected animals. Despite its low sensitivity, evidence suggests an association between ELISA sample-to-positive (S/P) ratio scores and various cow and calf traits. The objective of this study was to assess the association between four cow reproductive and weight traits, and three preweaning calf traits and ELISA S/P ratio scores for paratuberculosis (0 = negative, 1 = suspect, 2 = weak-positive, and 3 = positive) in a multi-breed herd of cows ranging from 100% Angus (A) to 100% Brahman (B). In addition, potential economic losses associated with ELISA scores were explored using prospective cow and calf market prices.

Materials and Methods

The study consisted of cows in the university research herd that were tested by ELISA as part of the annual herd monitoring and control program. Cows and calves in the herd were monitored for reproductive and production traits according to the long standing operating protocol of the unit. Records for the years 2002 through 2006 were collated and summarized to evaluate the study objectives. Thus, cow data included: 624 measures of gestation length (GL), 358 records of time open (or time to conception, TO), 605 calving intervals (CI), and 1,240 measures of weight change (from November to weaning, WC), from 502 cows (87 A, 91 $\frac{3}{4}$ A $\frac{1}{4}$ B,

58 Brangus, 125 $\frac{1}{2}$ A $\frac{1}{2}$ B, 67 $\frac{1}{4}$ A $\frac{3}{4}$ B, and 74 B). Calf data consisted of 956 birth weights (BWT), 923 weaning weights (WWT), and 923 weaning weights adjusted to 205 d of age (WW205) from 956 calves (132 A, 204 $\frac{3}{4}$ A $\frac{1}{4}$ B, 101 Brangus, 256 $\frac{1}{2}$ A $\frac{1}{2}$ B, 120 $\frac{1}{4}$ A $\frac{3}{4}$ B, and 143 B). Traits were analyzed individually using multi-breed mixed models that assumed homogeneity of variances across breed groups. Co-variances among random effects were assumed to be zero. Fixed effects were year, age of cow, sex of calf, year \times age of cow interaction (except WC), age of cow \times sex of calf interaction (only for WC), ELISA score, and covariates for breed fraction of sire and cow and heterosis of cow and calf. Random effects were sire (except for TO and CI), dam, and residual.

Results

Results suggested that Angus, $\frac{3}{4}$ A $\frac{1}{4}$ B, Brangus, and $\frac{1}{2}$ A $\frac{1}{2}$ B tended to have higher percentages of cows with zero ELISA scores than $\frac{1}{4}$ A $\frac{3}{4}$ B and B cows. In contrast, these latter two breed groups had higher percentages of cows with non-zero ELISA scores than the prior mentioned breed groups. Estimates of differences between cows with non-zero and zero ELISA scores were associated with lower cow fertility (longer TO), a lesser ability of cows to maintain weight (negative WC), lower calf BWT, and lower calf weaning weight (WWT and WW205).

Significance

Application of rudimentary economic measures, including an anticipated average market price for cows and calves, and taking into consideration TO, WC, and WWT as determined in this study, the potential losses of income due to subclinical paratuberculosis were estimated to be respectively \$19.8, \$34.3, and \$17.3 for each of the named variables (or a total loss of \$62.40) for cows with a positive ELISA score.