

Average daily gains and response to artificial insemination in beef replacement heifers with persistent subclinical *Theileria orientalis* Ikeda genotype infection

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Introduction

Theileria orientalis Ikeda genotype is a tick-borne hemoprotozoan that typically causes economic losses in dairy and beef cattle in Australia, New Zealand, and Japan. Clinical signs of theileriosis from *T. orientalis* Ikeda include anemia, icterus, ill-thrift, and death. The acute phase of the infection has been associated with a decrease in milk production in dairy cows, decreased libido in dairy bulls, decreased live weight gain in beef bulls, and increased mortality in naïve adults and calves. A sequela to acute infections within a herd is persistent subclinical infections and these have been associated with negative effects on reproduction in dairy cows and decreased mean daily gain in suckling beef calves. Prior to 2017, non-pathogenic genotypes of *T. orientalis* were present in the United States. In late 2017, *T. orientalis* Ikeda/genotype 2 was detected in beef cattle from multiple counties in Virginia and was associated with anemia, weakness, and death. As of 2020, *T. orientalis* Ikeda has been identified in beef cattle in 22 of 95 Virginia counties and 4 of 55 West Virginia counties. Beef production through primarily cow/calf operations is the second largest agricultural commodity in Virginia. After detection of *T. orientalis* Ikeda in a sub-population of spring breeding beef heifers at a replacement breeding farm, we thoroughly investigated the fall breeding heifers. The objective of this study was to determine if persistent subclinical infection with *T. orientalis* Ikeda affected the average daily gain (ADG) from arriving on farm to pregnancy verification or conception rates to artificial insemination (AI) in beef replacement heifers.

Materials and Methods

The fall heifers (174) arrived at the breeding farm on June 1, 2019, 4 weeks after weaning on their home farms. The heifers were weighed 3 times between arrival and breeding on July 16, September 26, and November 06, 2019. A whole blood sample was collected from the tail vein on October 23 for *T. orientalis* Ikeda testing. For the *T. orientalis* Ikeda testing, DNA was extracted from the whole blood sample for quantitative polymerase chain reaction (qPCR) analysis for

T. orientalis Ikeda. Cycle count thresholds of <39 indicated a positive for *T. orientalis*, further qPCR tests indicated specificity to the *T. orientalis* Ikeda genotype. The heifers were synchronized with a 14-d CIDR® -PG and timed AI on November 25, 2019. A week later, the heifers were exposed to bulls. On February 04, 2020, ultrasound diagnosis of pregnancy was performed and the heifers were weighed again. Average daily gain was compared using a two-tailed Student's T-test with equal variances as determined by the F-test. Pregnancy status results were compared with a Chi-square contingency table with Fisher's exact test for significance.

Results

Of the 174 heifers tested for *T. orientalis* Ikeda on October 23, 13 were positive. For determination of ADG, 11 heifers were removed (all negative heifers) due to not recording all pertinent weights. There is no significant difference ($p=.77$) between the ADG of the negative (1.60 ± 0.30 lb [0.7 ± 0.1 kg]/day) and positive (1.63 ± 0.25 lb [0.74 ± 0.11 kg]/day) heifers from farm arrival to pregnancy diagnosis. If ADG is calculated for each period between weights, there is no difference in ADG between the *T. orientalis* Ikeda negative and positive heifers at any period. For comparison of pregnancy status, 3 negative heifers died prior to pregnancy diagnosis, therefore only 171 heifers are included in this analysis. Comparing the pregnancy status of *T. orientalis* Ikeda negative and positive heifers at pregnancy diagnosis indicates no significant difference between AI bred or bull bred/open heifers ($p=0.15$).

Significance

Though many facets of *T. orientalis* Ikeda infection in the US have not yet been determined, this research provides preliminary evidence that persistent subclinical infection in heifers does not affect ADG post weaning or reproductive capabilities in regards to timed AI.