

Acute anaplasmosis reduces breeding soundness in experimentally-infected beef bulls

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Introduction

Bovine anaplasmosis is a source of significant economic and production loss to the cattle industry in the United States, costing a modest estimate of \$300 million in losses annually. The causative agent of bovine anaplasmosis, *Anaplasma marginale*, places herd management and financial strains on cow-calf producers in the U.S., a majority of which exist in anaplasmosis-endemic areas. Bulls servicing these herds are considered most valuable for their ability to reproduce. Death or disease in bulls which impairs their reproductive ability has significant consequences for producers and their herds. Clinical anaplasmosis signs, such as hemolysis and fever, may reduce bull breeding soundness. The objective of this study was to evaluate changes in breeding soundness outcomes and clinical changes in beef bulls over the course of acute anaplasmosis, from prior to infection, throughout development of clinical disease, and upon recovery.

Materials and methods

Six healthy, *A. marginale*-negative, 2- to 5-year-old, Angus bulls of satisfactory breeding status were included in the study. Bulls were block-randomized based on age and weight to an uninfected control group or an *A. marginale*-infected group. Fresh blood from a naturally infected cow from the bulls' herd of origin was used to challenge the three bulls in the *A. marginale*-infected group. All bulls were monitored for signs of acute anaplasmosis, progression of *A. marginale* infection, seroconversion, and breeding soundness. Bulls were observed daily for overt clinical signs of disease (anorexia, lethargy); and, development of fever, anemia via packed cell volume (PCV), and presence of pale or icteric mucous membranes were evaluated weekly. Progression of *A. marginale* infection was evaluated by quantitative PCR and via percent parasitized erythrocytes (PPE) in stained blood smears. Seroconversion was monitored by cELISA. Injectable oxytetracycline was administered to bulls with a PCV <15% or a temperature >105°F. Weekly breeding soundness examinations, per the 2018 Society for Theriogenology Manual for Breeding Soundness Examination of Bulls guidelines, were performed on all 6 bulls for 16 weeks, beginning 3 weeks prior to *A. marginale* challenge and continuing for 60 days post-peak infection. Semen samples were collected via electroejaculation. Breeding soundness parameters assessed included sperm morphology and progressive motility, external and internal genitalia, and general physical examination.

Results

All *A. marginale*-challenged bulls were PCR-positive, seropositive and exhibited clinical disease signs by 3-, 17-, and 24-days post-challenge, respectively. The most frequent clinical signs of acute anaplasmosis included loss of body condition, pale or icteric mucous membranes, and elevated rectal temperatures (> 104.3°F). Acute anemia was observed in all challenged bulls with PCV nadirs ≤ 18% and peak PPEs ≥ 50%. Breeding soundness outcomes of sperm progressive motility and morphology, and satisfactory breeding potential of each infected bull were significantly reduced within days following onset of clinical signs and continued for weeks beyond resolution of clinical anaplasmosis. Bulls in the control group remained negative for *A. marginale* by PCR, never seroconverted, displayed no signs of clinical anaplasmosis, nor developed any consistent, group-level reductions in individual breeding soundness parameters.

Significance

Reduced breeding soundness has significant clinical and economic implications for successful breeding in commercial beef herds. More specifically, undesirable bull breeding soundness outcomes related to episodes of acute anaplasmosis have critical herd implications especially for cow-calf producers in endemic areas in the United States. Findings from this study suggest acute anaplasmosis is a driver of reduced breeding soundness in beef bulls. This study supports the need for, annual evaluation of breeding soundness in bulls and for producers to establish a working knowledge of their herd anaplasmosis status.

