

Research Summaries 3

Predicting bull mounting behavior using classification algorithms

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Introduction

Data from multiple-sire beef cattle pastures have shown variability exists among the number of calves sired per bull. The reason(s) for the variability is unknown. Successful investigation of possible reasons requires accurate recording and evaluation of bull behavior. The purpose of this study was to assess the accuracy of classifying bull mounting events in a multiple-sire pasture using accelerometer data and classification algorithms.

Materials and Methods

Two bulls and 10 estrus-synchronized cows were placed in a pasture for 4 days. Accelerometers were attached to each bull's left ear, right ear, neck, and wither, and data were simultaneously logged to video to quantify the time and duration of each behavior. Video data and accelerometer data were combined based on the time the behavior event occurred. Data were sub-grouped and analyzed as single and multiple datasets, based on the tag location on the bull. Fifty

percent of the data was randomly partitioned for training the algorithms to identify specific mounting behavior, 25% was randomly partitioned for testing in order to refine the algorithms, and 25% of the data was used for validation to determine accuracy of each algorithm. Accuracies were compared between the different classifiers for each sub-group.

Results

The prevalence of a mounting event ranged from 0.6% to 0.7% of the total time available for each sub-group. The accuracy of the best performing classifier ranged from 74% to 78%.

Significance

Mounting events by bulls are difficult to classify with high accuracy using accelerometer data because of the low prevalence of mounting events and imperfect specificity of the algorithms to classify mounting events.

Ulcerative penile lesions in beef bulls due to pseudocowpox virus

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Introduction

An Angus-cross cow-calf operation in Montana has had a 4-year history of bulls developing ulcerative penile lesions and refusal to breed 3 weeks into the breeding season. The problem appeared to move through the herd affecting the bulls exposed to 1 breeding group the first year, 2 breeding groups the second year, and bulls exposed to all breeding

groups the third year. No vaginal exams were performed on the cows prior to our involvement. Calving rate was high in the herd all 4 years, however; the owner was using twice the number of bulls necessary to maintain this. The penile lesions on the bulls would appear to heal within 2 to 3 weeks of sexual rest and the bulls would be returned to the breeding herds at that time. Bulls with lesions that were retained for multiple years would get lesions multiple times in 1 season

and year after year. The herd also had 3 milk cows which were milked by the owner and had a history of circular pox-like lesions on their teats.

Materials and Methods

Diagnostic tests performed by the referring veterinarian included viral isolation, culture, and infectious bovine rhinotracheitis (IBR) serology. Most of the results from these tests were negative except for parapoxvirus isolation from 4 samples and 1 *Ureaplasma* positive from culture. Upon our involvement in 2015, examinations were performed looking at teats and vaginas of 26 cows, and penises of 3 bulls. Three bull penises and 10 cow vaginas were swabbed and placed in viral transport media for viral isolation, aerobic and anaerobic culture, PCR for (IBR, herpes viruses, pseudocowpox virus), *Ureaplasma*, and *Mycoplasma* cultures. Blood samples were taken from 16 cows, 1 calf, and 3 bulls for pseudocowpox serology. In 2016 testing was performed both pre-breeding season and 3 weeks into the breeding season once lesions started to develop in the bulls. Swabs were taken for viral isolation, *Ureaplasma/Mycoplasma* cultures, and pseudocowpox virus PCR. Blood samples were taken for pseudocowpox virus serology and trace mineral evaluation.

Results

The 2015 post-breeding season examinations and testing resulted in 3 of 3 bulls having penile lesions or healing lesions; 11 of 26 cows having healing vaginal lesions; and 1 positive viral isolation of pseudocowpox virus from 13 cows

and bulls tested. Two positive *Ureaplasma* cultures resulted from 6 cows and bulls tested. One positive pseudocowpox PCR resulted from 13 cows and bulls tested (the positive sample was from the same bull that had the viral isolation-positive result). PCR results for herpes virus and IBR specifically were negative from 8 cows tested. Pseudocowpox serology resulted in 20 positive samples from 20 samples taken. The 2016 pre-breeding season examination and testing results were: 0 of 43 animals had lesions; 6 of 12 samples were positive for *Mycoplasma* cultures; 4 of 12 samples were positive for *Ureaplasma* culture; and 41 of 43 samples were positive for pseudocowpox virus serology. Twelve of 12 cows and bulls tested deficient in serum copper levels. Breeding season examinations revealed ulcerative penile lesions in 8 of 10 bulls, and vaginal lesions in 5 of 12 cows examined. Viral isolation swabs and pseudocowpox virus PCR are still pending. All breeding season testing is still pending.

Significance

The testing of this herd over the last 4 years has revealed that exposure to pseudocowpox is widespread in this herd. *Ureaplasma* and *Mycoplasma* are also present, however, these bacteria are thought to be normal surface inhabitants of the male and female reproductive tract with occasional secondary pathological infections. The herd is deficient in copper, which has been associated with immune dysfunction. There is 1 other reported case of a bull with ulcerative penile lesions thought to be associated with pseudocowpox. It is possible that this is an emerging disease or a disease that has been underreported.

Using a deterministic systems model to examine the effects of the postpartum period on cow-calf productivity over 10 years

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Introduction

The duration of postpartum anestrus is important to consider for reproductive momentum and efficiency in cow-calf operations. It is challenging to fully understand the long-term impacts that the average duration of postpartum anestrus has on production. We developed a deterministic model of cow-calf production over 10 years using the software program Stella Professional to model the effects that

various postpartum anestrus lengths have on measures of herd productivity, including the percent of cows pregnant at pregnancy diagnosis and the pounds of calf weaned per cow exposed.

Materials and Methods

For all model herds, eligible heifers were bred to a single artificial insemination followed by natural service exposure