

Near Infrared Spectroscopy as a Potential Method to Detect Bovine Respiratory Disease

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Introduction

Bovine respiratory disease (BRD) continues to be the leading cause of illness and death loss from weaning through finishing. There is no objective method to evaluate a live animal's severity of sickness or their response to treatment. A pilot study was conducted at a commercial feedyard to evaluate the ability of near-infrared spectroscopy to differentiate between cattle identified as healthy and those identified as having undifferentiated bovine respiratory disease. At processing, 215 randomly selected 900 lb (409 kg) heifers were evaluated to determine tissue oxygen saturation (StO₂) levels. Mean ranks of the StO₂ values were found to be 176.86± 5.50. One-hundred head of cattle pulled for clinical signs of bovine respiratory disease were evaluated in the hospital. Animals were classified as first pull, second pull and third pull based upon clinical observations. First pull animals were those with no previous history of being treated for respiratory disease and having signs of BRD with rectal temperature at or above 104° F (40° C). Second pulls and third pulls were those animals failing to respond to either a first treatment or a second treatment for BRD as evidenced by no improvement in clinical appearance or rectal temperature remaining above 104.0 F. Mean StO₂ ranks were 110.42 ± 11.29, 120.08 ± 14.48 and 132.83 ± 19.00 for first, second and third pulls, respectively. A significant difference was found between the rank of the StO₂ values in cattle at processing and those classified as first, second or third pulls (P<0.05). No difference was found between the three pull classifications. The authors feel that the results shown in this study provide the basis for further research in the evaluation of BRD with near-infrared spectroscopy.

Materials and Methods

A total of 315 cattle were evaluated to determine percent StO₂. Two hundred and fifteen head of 900 lb heifers were randomly assessed at processing using near-infrared spectroscopy on the ventral aspect of the tail. Hutchinson Technology Near-Infrared Spectrometer (InSpectra) was used with the 20 mm probe. The probe was oriented such that the tip of the probe was

cranial with light reflected dorsally into the ventral aspect of the tail with the coccygeal artery being the target of interest. One hundred head of cattle, which were not part of the original 215, were evaluated in the hospital using the same technique. These animals ranged in weight from 450 lb (204 kg) to approximately 750 lb (341 kg). The cattle from the hospital were broken into three groups based on feedlot records. The three groups were first pull, second pull and third pull. Cattle never having been identified previously with bovine respiratory disease were placed in the first pull group. Cattle that required treatment for BRD a second time were placed in the second pull group, and cattle that had to receive a third treatment for BRD were placed in the third pull group. All cattle enrolled on the study from the hospital had to meet the requirements of a rectal temperature greater than or equal to 104 F and/or appear clinically ill based on standard treatment protocol for this particular feedyard.

Initial statistical analysis revealed that the data was not normally distributed, therefore, ranks were assigned to the StO₂ values, and these ranks were then analyzed with the mixed procedure in SAS.

Results

Cattle at processing had a mean StO₂ rank of 176.86 ± 5.50 (Table 1) with a StO₂ range of 78 – 98. Of the 100 head sampled at the hospital, 51 were in the first pull category, 31 in the second pull group and 18 in the third pull group. The mean ranks were 110.42 ± 11.29, 120.08 ± 14.48 and 132.83 ± 19.00 with StO₂ values ranging from 42 - 98, 70 - 98, and 84 - 98, respectively. A significant difference was found between the rank of the StO₂ values in cattle at processing and those classified as first, second or third pulls (P<0.05). No difference was found between the three pull classifications.

Significance

BRD is the primary cause of feedlot mortality as well as having an enormous economic impact on the industry. According to the 1999 NAHMS study, 56.8% of all feedlot mortalities are due to respiratory disease.

This study also states that 14.4% of 11.75 million head of cattle were treated for BRD at a cost of \$12.59 per animal for a total of \$21.3 million for the year the study was conducted. There is currently no technique available that will allow producers and practitioners to objectively evaluate an animal for BRD and attempt to control these costs. Near-infrared spectroscopy may give the industry the ability to make objective decisions regarding the management and treatment of BRD. Based on the significant difference of the ranks between the cattle at processing and the cattle identified as being ill, near-infrared spectroscopy may prove to be a good technique to aid in the management of BRD.

Near-infrared spectroscopy can potentially be used in the purchasing, sorting and treating of cattle with

BRD. Cattle could be assessed at purchase to determine if there is any pre-existing lung pathology. StO₂ may also be able to detect cattle that will perform better than others in both the feedyard and the packing-house. Near-infrared spectroscopy may be able to reveal if cattle have too much existing pathology to be treated effectively, or if cattle that we think are "treated-out" can still benefit from antibiotic therapy. Near infrared spectroscopy has the potential to drastically affect the way BRD is managed, and beef production in general. Using near-infrared spectroscopy, producers and veterinarians may be able to make informed, objective decisions about the management of their cattle.

A Study to Compare the Efficacy of Three Oxytetracycline Regimens for the Treatment of *Anaplasma Marginale* Carrier Status in Beef Cattle

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Introduction

Anaplasmosis is a blood-borne disease of cattle and other ruminants caused by *Anaplasma marginale*. Animals recovering from clinical anaplasmosis and those treated with therapeutic doses of oxytetracycline remain persistently infected with microscopically undetectable levels of the organism. These animals serve as reservoirs of the disease which can be spread mechanically or through arthropod vectors. Tetracyclines are the only compounds approved for treatment of acute anaplasmosis infections in the United States; however no compounds are approved for eliminating the carrier state. This has contributed to the restricted movement of cattle from endemic areas of the US to anaplasmosis-free territories such as Canada. Anaplasmosis is estimated to cost the US cattle industry \$100 million per year, with some estimating the cost of restricted trade to be near \$300 million annually. The objective of this study was

to compare the effects of three oxytetracycline treatment regimens on eliminating *Anaplasma marginale* infection from carrier beef steers.

Materials and Methods

Forty-six Angus X Simmental steers, aged 6 - 12 months, were inoculated IV with approximately 2.6×10^9 *Anaplasma marginale* (Oklahoma isolate) infected erythrocytes. Animals were monitored for parasitemia on blood smear and changes in hematocrit. Serology was also conducted using a competitive ELISA Anaplasma Antibody Test Kit (VMRD, Inc. Pullman, WA). All subjects demonstrated clinical signs of anaplasmosis and recovered without treatment. The ability of carriers to transmit *A. marginale* was demonstrated by sub-inoculation of 50 ml of heparinized blood into 45 splenectomized Holstein calves. The diagnosis of anaplasmosis in splenectomized calves was based on the presence of