IOWA STATE UNIVERSITY
Veterinary Microbiology and Preventative Medicine

Honors Capstone Project
Fall 2020

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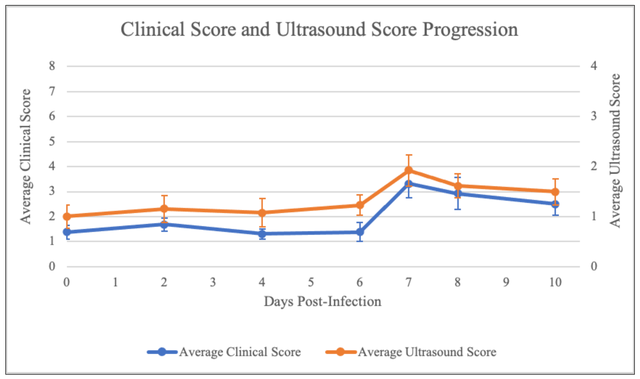
Effects of Bovine Respiratory Disease on Pre-Weaned Calf Performance

Abstract

Bovine respiratory disease (BRD) is a complex interaction of viral and bacterial infections that can lead to lowered performance especially in young calves. Early detection and treatment are key in treating BRD, however, early detection can be very difficult. Thoracic ultrasonography (TUS) can be easily performed calf-side to help aid in the detection of BRD. In the current study, thirteen calves were followed for a three weeks pre-infection, then infected with Bovine Respiratory Syncytial Virus (BRSV) and six days after infected with *Pasteurella multocida* and followed for an additional four days. Body weights were collected weekly and grain intake was measured daily. TUS was performed on days 0, 2, 4,6, 7, 8, and 10 after infection, and disease progression was scored on a scale of 0-4 with 0 indicating no disease present and 4 indicating severe disease. Ultrasound scores were then correlated with average daily gain (ADG) and feed conversion efficiency (FCE) pre- and post-infection. Results suggest a negative correlation between ADG and TUS score, and between FCE and TUS score suggesting that TUS could serve as a useful diagnostic tool in detecting calves that are likely to experience lowered performance.

Disease Progression



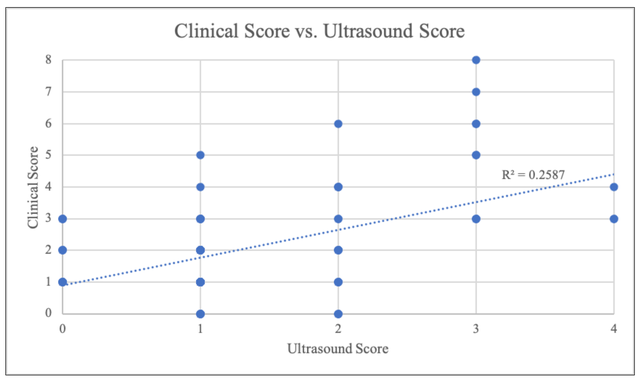
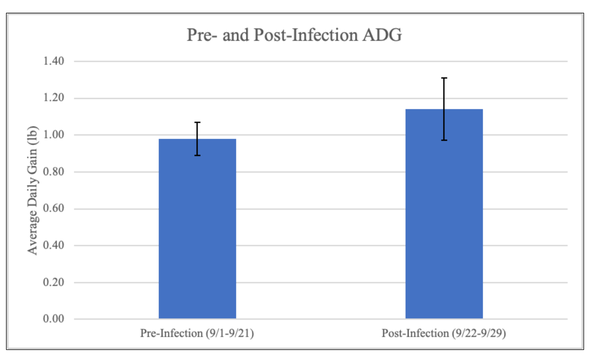
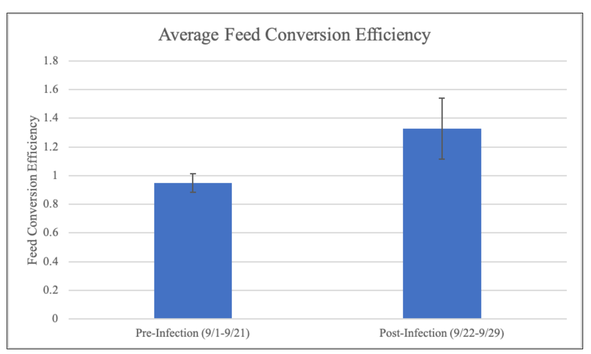
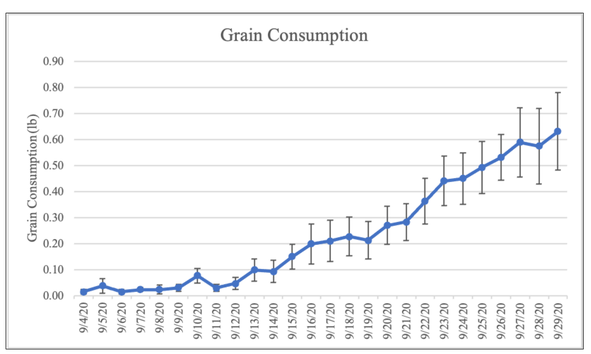


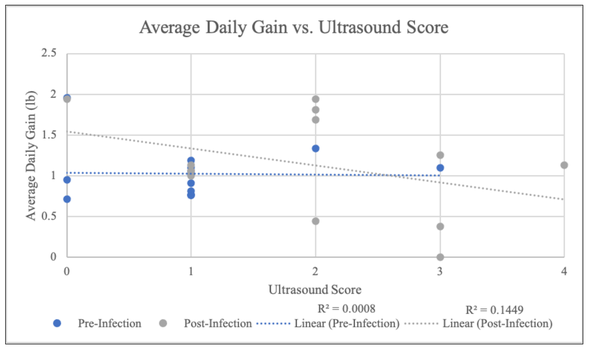
Fig 1. Bovine respiratory syncytial virus and *Pasteurella multocida* infection causes an increase in clinical score and thoracic ultrasonography (TUS) score. Clinical scoring measures rectal temperature, lung sounds, coughing and other external indicators of disease. Ultrasound score measures presence of comet tails and consolidated lung tissues. There is a positive correlation between clinical score and ultrasound score indicating TUS can also detect presence of clinical disease. Data represent mean ± SE.

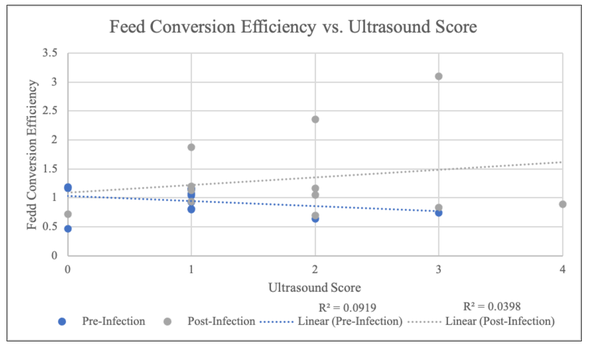
Calf Performance Markers











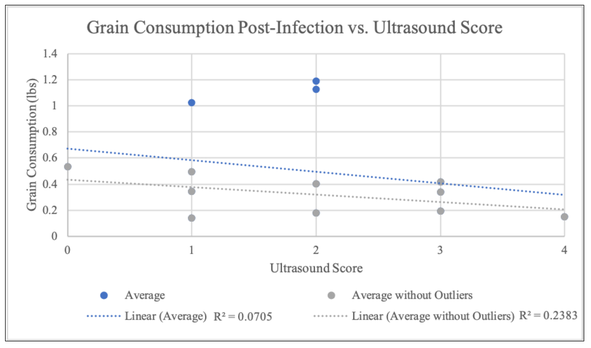


Fig 2. Difference in pre- and post-infection ADG is correlated with ultrasound score. Pre-infection ADG was calculated using the calf weight upon entrance into the study and calf weight three weeks later on the day of infection. Post-infection ADG was calculated using calf weight on the day of infection and calf weight one week later. ADG increased in the post-infection phase of the study ($p<0.25$). Using ultrasound score as a marker of clinical disease there was a stronger correlation between ADG and ultrasound in the post-infection phase. As ultrasound score increased ADG suggesting a loss in performance when more severe disease is present. Data represents mean ± SE.

Fig 3. Significant difference in feed conversion efficiency pre- and post-infection is correlated with ultrasound score. FCE was calculated by dividing the pounds of grain and milk consumed by the net weight gain of a calf over the described time periods. There was a significant decrease in efficiency ($p<0.06$) in the post-infection phase. Ultrasound score again was used as an indicator of clinical disease. There was limited correlation in both the pre- and post-infection phases however the change between the two was similar to the results seen between ultrasound score and ADG. In the post-infection phase increased ultrasound scores were correlated with a loss in efficiency. Data represents mean ± SE.

Fig 4. Grain consumption continued to increase post-infection with higher variability than pre-infection. Grain consumption continued to increase through the post-infection phase with an increased variability. Consumption and ultrasound score had limited correlation when three outlier calves were included, and more significant correlation when the outlier calves were removed. These outlier calves may also by inflating consumption data. Data represents mean ± SE.

Conclusions

- TUS is correlated with traditional clinical scoring methods and can be used as an indicator of disease presence
- TUS was slightly correlated with ADG, FCE, and consumption indicating that TUS can serve as a method to identify calves at risk of experiencing losses in production
- Although ADG remained unaffected by infection and consumption increased, FCE was affected indicating that although the calves are maintaining their weight gains, they are requiring more food intake to do so
- Disease within the lungs, as indicated by ultrasound scores, in early life is believed to have lasting effects on performance, so identifying sick calves early on is key to maintaining health and performance

Acknowledgements: Amanda Kreuder, DVM