



“Investigation of the role of BVD virus and *Mycoplasma bovis* in early stage bovine respiratory disease pathology”

IMPROVED PREVENTION AND MANAGEMENT OF BOVINE RESPIRATORY DISEASE

PROJECT NO.: 0007-035

RESEARCH INSTITUTION: Feedlot Health Management Services Ltd.

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Background: Bovine respiratory disease (BRD) continues to be an important animal health concern, particularly in cattle arriving to the feedlot. Up to 25% animals that die of BRD have been treated within a week of arrival at the feedlot, indicating these cattle may have been exposed to factors which result in BRD even before they got to the feedlot. Stressors such as weaning, transport, and commingling may compromise the animal’s immune system, and crowding may promote the transmission of infectious agents among animals. Many infectious agents have been associated with BRD. A primary pathogen such as BVD virus may alter an animal’s immune defenses, allowing bacteria such as *Mannheimia hemolytica* and/or *Mycoplasma bovis* to colonize the lower respiratory tract. At present, visual assessment of calves and rectal temperatures are commonly used to identify “sick” animals at arrival, and research into alternate methods for early detection of BRD may lead to improved prevention, treatment and management of BRD in feedlots.

The purpose of this study was to investigate whether live-animal ultrasound and lung biopsy could help identify early cases of BRD. This project was completed in 2008.

Objectives: To determine if:

1. live-animal ultrasound could be used to identify structural changes in the lung, and if samples of lung tissue or fluid from live-animal lung biopsy could be evaluated for respiratory disease organisms in young cattle arriving at the feedlot,
2. lung lesions identified using ultrasound or biopsy at arrival to the feedlot and/or at the time of first respiratory disease diagnosis were associated with health and production outcomes (sickness, death, presence of disease organisms and rate of gain), and
3. the risk of morbidity and mortality in groups of cattle could be accurately predicted using ultrasound or live-animal lung biopsy, potentially improving BRD prevention, treatment and/or management strategies.

What they did: Preliminary trials: Since ultrasound and lung tissue sampling (biopsy) techniques are not commonly used for diagnosing BRD in feedlot cattle, the first step was to determine where to collect the ultrasound images or biopsy samples (e.g. which ribs to scan or sample between, how high on the body wall, what landmarks to look for in the images or samples, etc.). Once this was determined, the second step was to validate these procedures in animals with clinical disease or lung lesions.

Animals chronically with BRD were chosen for this process. These animals were euthanized and post-mortems performed. The live-animal ultrasound images were compared with the lung from post-mortem examination, and the biopsy tissue samples were examined for signs of infection and tested for a number of microorganisms that are known to be involved in BRD.

Feedlot trials: Once the ultrasound and biopsy techniques were developed and shown to work on clinically sick animals, the next step was to determine whether they could also work to identify early cases of BRD in feedlot calves. This part of the study used auction-sourced calves at a commercial feedlot. Calves were processed (vaccinated, implanted, etc.) according to typical feedlot protocols to ensure that the ultrasound and biopsy techniques were being evaluated in standard field conditions. Two sets of comparisons were made. Firstly, calves that had a fever and signs of respiratory disease on arrival were compared to calves that were healthy at arrival. Secondly, calves that were healthy on arrival were divided into three groups. Calves that remained healthy were compared to both calves pulled from the pen for respiratory symptoms/fever, and to calves pulled for respiratory symptoms/no fever. Ultrasound images and biopsies were collected when the initial diagnosis was made, then again 2, 4 and 6 weeks later.

What they learned: Preliminary trials: In animals with severe BRD, ultrasound lesions were consistent with post-mortem lung lesions. However, it was difficult to consistently collect large enough lung tissue samples using the biopsy technique. As a result, the biopsy technique was modified to obtain better samples in the feedlot trial.

Feedlot trials: Many of the cattle that were sick on arrival had no lesions detected by ultrasound, and some cattle that had lesions on arrival didn't require follow-up treatment. The ultrasound and biopsy techniques were more likely to identify lesions in animals that were pulled and treated for respiratory disease/fever than in cattle that had a fever on arrival, perhaps because the pen-pull animals were more likely to be visibly ill or had time to develop more severe lesions.

However, neither the ultrasound nor the biopsy technique could accurately predict which animals would subsequently develop BRD, and only one

animal was found to have BRD-associated microorganisms in the biopsy tissue samples.

What it means: This was the first attempt to use ultrasound and lung biopsy techniques in Alberta to diagnose or predict BRD in feedlot cattle. Further refinements of these techniques may allow the development of better tools to manage chronically sick animals, as well as methods of monitoring the effectiveness of BRD prevention, diagnostic, and treatment programs in a commercial feedlot environment.



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