

Final Report Review

Title: Metabolic biomarkers for enhanced diagnosis of bovine respiratory disease

Lead Project Director:

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Award Amount: \$62,311

Nontechnical Summary:

Bovine respiratory disease (BRD) is a costly disease of cattle caused by a multitude of predisposing factors and pathogens. Stress associated with auction markets, shipping, comingling, weather and diet change can predispose cattle to BRD. Exposure to viruses such as IBR, BVD, and BRSV can suppress lung defenses resulting in pneumonia caused by bacterial pathogens such as *Mannheimia*, *Pasteurella*, *Mycoplasma*, and *Histophilus*. Although antibiotics are available to treat BRD effectively, accurate diagnosis before lung damage has occurred limits response to treatment. Metabolic biomarkers can enhance the ability to rapidly diagnose and manage BRD. The objectives of this project were to identify biomarkers indicative of BRD and determine if metabolic biomarkers are specific to individual pathogens. Samples of breath, nasal secretions, plasma, and nasal swabs were collected from 44 calves pulled for BRD and 73 normal calves at a commercial feedlot. Frequencies of *Mycoplasma bovis* and *Mannheimia haemolytica* were greater in nasal swabs of calves pulled for BRD than normal calves. Abundances of 2Butanone in breath, plasma, and nasal secretions were greater in normal calves than calves pulled for BRD. In contrast, abundance of 2Propanol tended to be greater in calves pulled for BRD than normal calves. The differences in the abundances of 2Butanone and 2Propanol between normal and diseased calves imply that they are potential biomarkers for the diagnosis of BRD. Although the benchtop multidimensional gas chromatograph-mass spectrometer technology used in this experiment are too expensive and large for field use, the cost of portable units continues to decline and shows promise for immediate analysis of biomarkers in breath samples in feed yards.

Impacts

- Calves treated for bovine respiratory disease had greater incidences of *Mycoplasma bovis* and *Mannheimia haemolytica* in nasal swabs than normal control calves.
 - These pathogens may be the primary causes of bovine respiratory disease in feedlot cattle.
- Normal control calves had greater abundance of 2 Butanone in blood plasma, breath, and nasal secretions and lower abundance of 2 Propanol than calves treated for bovine respiratory disease.
 - These compounds may serve a biomarkers for bovine respiratory disease in feedlot cattle.

- This knowledge provides the basis for the development of a portal detector that can be used in feedlots for early detection of bovine respiratory disease.

Conclusion(s):

- Biomarker technology may be a usable tool to assist feed yards diagnose respiratory disease
 - 2 Butanone and 2 Propanol may be used to differentiate between healthy and diseased cattle.
 - Further work is needed to determine critical cutoff points where these biomarkers can identify healthy or sick animals.

Technology transfer (Planned or Completed)

Scientific papers – None reported

Extension/Outreach – None reported

Scientific presentations – None reported

Extension/Outreach presentations – None reported

Students supported (Total or Partial)

Graduate students – 2

Undergraduate students – 0

Leveraged funding

\$0