RESEARCH

"Development of recombinase polymerase amplification (RPA)-based innovation platform for rapid detection of antimicrobial resistant (AMR) bacterial pathogens that cause bovine respiratory disease (BRD)."

NEW DIAGNOSTICS TO INFORM ANTIMICROBIAL TREATMENT DECISIONS

PROJECT NO.: ANH.06.16
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Background: Bovine respiratory disease (BRD) is a complex and multifactorial issue that is the leading cause of morbidity and mortality in the feedlot. Involving bacteria (Mannheimia haemolytica, Histophilus somni, Pasturella multocida and Mycoplasma bovis) as well as viruses, individual animal characteristics and environmental influences, treatment and prevention of BRD continues to rely heavily on antimicrobials. Given increasing public scrutiny on beef production, including antimicrobial use (AMU), as well as the development of multi drug resistance in some BRD pathogens, an informed, targeted approach to treatment and prevention would improve animal health and welfare outcomes. This could also minimize the usage of antimicrobials that would be ineffective due to pathogen resistance.

The current technology available to accurately identify BRD pathogens as well as any associated antimicrobial resistance (AMR) relies on a culture and sensitivity method, where the bacteria is cultured, exposed to an antimicrobial, and assessed for survivability. This method can be useful for AMR surveillance and the development of general treatment protocols, but requires a longer time frame than is practical for immediate treatment decisions. This project proposes to use a DNA based detection system similar to those used in point of care diagnostics for human medicine in remote locations.

Objectives: The objectives of this study are to:

- Design and screen the appropriate DNA primers and optimal temperatures for detection of BRD pathogens and common AMR genes.
- Develop a test that can detect multiple pathogens and AMR genes at the same time.
- Determine the specificity (true positive rate) and sensitivity (true negative rate) of the test under practical conditions in both healthy cattle and those diagnosed with BRD.
- Evaluate the performance of the test's ability to correctly detect BRD pathogens and AMR profiles.
- Develop a portable test kit and validate it under field conditions in a commercial feedlot.

Implications of the Research: By correctly identifying the pathogens and any associated AMR in cattle diagnosed with BRD, treatment decisions can be made to ensure that the right drug is used for the right bug, reducing inappropriate use of antimicrobials (by ensuring that the pathogen is susceptible to the antimicrobial used), and improving treatment effectiveness.

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