

Effects of innate immune stimulation on naturally occurring respiratory disease in beef calves.

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Introduction

Stress- and virus-induced immunosuppression are considered major risk factors for the development of bovine respiratory disease (BRD) in beef calves. Although vaccines and the metaphylactic use of antibiotics are available to minimize BRD in herds, it continues to be the leading cause of morbidity in feedlot calves. Research in mice found that lethal bacterial pneumonia was prevented by stimulating the innate immune system. The purpose of this study was to determine if stimulation of innate immune responses on arrival to a feedlot could decrease the prevalence and severity of naturally occurring BRD in beef calves.

Materials and Methods

Sixty low bodyweight steers (divided into 4 groups), commingled from different sources, were purchased from a sales barn and transported to the Elora Beef Research Station. Study animals were matched by body weight and randomly assigned to receive control treatment (phosphate-buffered saline; n=30) or *E. coli* and *S. aureus* lysate (n=30) delivered via nebulization. Researchers and farm staff were blinded to treatment group. Body weight, rectal temperature, serum haptoglobin, plasma fibrinogen, quantitative evaluation of bacterial pathogens in the nasal cavity, and results of targeted lung ultrasounds were recorded at baseline and regular intervals up to 1 month after arrival. Farm operators treated animals exhibiting clinical signs of disease according to farm protocols and full post-mortem examination was performed on any animals that died over the study period.

Results

Aerosolized bacterial lysate was well tolerated by calves during pilot studies and administration resulted in transient increases in rectal temperature, respiratory rate, and neutrophils in bronchoalveolar fluid. Unexpectedly, the mortality rate attributed to *Mycoplasma bovis* was 6 times more likely ($P=0.04$) in calves that received the bacterial lysate (n=6) compared to control calves (n=1). Farm staff identified clinical illness (depression, reduced appetite, or respiratory signs with an elevated rectal temperature) in 70% of immunostimulated calves versus 53% of control calves. Calves receiving the immunostimulant had lower weight gains at 1 month after arrival compared to control calves ($P=0.05$). Inflammatory markers and lung ultrasound scores were similar between the 2 groups.

Significance

Stimulation of innate immune responses with bacterial lysate upon arrival at the feedlot was unsuccessful in preventing BRD in high-risk steers, and unexpectedly reduced weight gain and increased mortality. The results of this study suggest a potential relationship between pulmonary inflammation and the subsequent development of *Mycoplasma bovis* pneumonia.