



21-22 November 2024

BOVINE RESPIRATORY SYNCYTIAL VIRUS AND PARAINFLUENZA-3 COMMON CAUSES OF RESPIRATORY DISEASE IN CATTLE – A REVIEW

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Abstract: Economic burden to the feedlot industry due to its high mortality and morbidity caused by bovine respiratory diseases, pneumonia being the most common cause of death in cattle over one month of age. Bovine respiratory disease complex is caused by a variety of viral, bacterial and fungal pathogens. Viruses commonly implicated in BRD are BRSV and BPIV3, which are enveloped viruses with non-segmented, single-stranded, negative-sense RNA genomes. BRSV infections can be subclinical or develop in a severe form, whereas BPIV3 is considered a minor pathogen and usually associated with mild to subclinical infections. Specific clinical signs, PCR test or immunohistochemical testing, serological testing (ELISA) and thoracic ultrasound are used for diagnosis. Because there is no specific treatment for viral pneumonia, the treatment focuses on the use of antimicrobials to control secondary bacterial pneumonia together with the supportive treatment. Vaccination for BRSV could reduce losses, but studies on its efficiency are few. Prevention of bovine respiratory disease has an important role and must be focused on respecting vaccination protocol for respiratory pathogens along with reducing the stress factors to have a healthy immune system and healthy individuals.

Keywords: bovine, respiratory disease, syncytial virus, parainfluenza-3.

• Introduction

- Respiratory diseases in cattle are known as pneumonia.
- Pneumonia is a complex, multifactorial disease that results in inflammation and damage to the lungs and respiratory tract. It is the most common cause of death in cattle of all ages, starting at one month of age, and has a negative impact on the growth and yield of beef and dairy cows.
- Most often the resulting losses are due to secondary bacterial infections associated with viral diseases. Some of the causes of pneumonia are the microorganisms that live in the upper respiratory tract as saprophytes, which under stress (climate changes, ration changes, herd changes or transport), these pathogens can multiply and migrate to certain areas, such as the lungs, where they can cause pneumonia.
- Economic losses from bovine respiratory diseases in the United States have been estimated at \$640 million annually, with these diseases being much more severe in weanling calves than in cattle one year old or older.
- Viruses commonly implicated in bovine respiratory disease are: IBR (infectious bovine rhinotracheitis), BVDV (bovine viral diarrhea virus), BRSV (bovine respiratory syncytial virus) and Pi3 (bovine parainfluenza type 3).

• Material and method

- Studies and research that were conducted on the subject at hand (key words: bovine respiratory diseases, BRSV, Pi3, diagnosis) as well as other publications, were selected (using PubMed, Science Direct, Google Academic) and used for this review.

• Results and discussions

- Most common causes of respiratory diseases in cattle. Two related viruses: BRSV and BPIV3 belong to the order Mononegavirales.

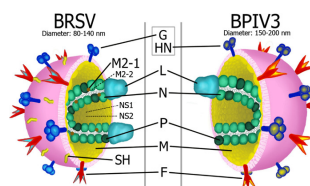


Fig. 1 Morphology of BRSV and BPIV3. G: G protein; HN: Haemagglutinin – Neuraminidase; L: Polymerase protein; M: Matrix protein; N: Nucleoprotein; P: Phosphoprotein; F: Fusion protein

- Common clinical signs of BRSV and Pi3 include the following: fever (40–42°C), apathy, inappetence, hyperpnea, cough, nasal discharge, conjunctivitis, subcutaneous emphysema, cranioventral pulmonary consolidation, bronchiolitis, and alveolitis with marked congestion and hemorrhage. Due to interstitial pneumonia, harsh breath sounds are evident on auscultation.



Fig. 2 Serous nasal discharge

Diagnostic

- PCR test or immunohistochemical testing
- Paired serological testing (ELISA)
- Thoracic ultrasound - the sensitivity of ultrasonography in diagnosing pneumonia has been estimated to be 80%–94%, and the specificity has been estimated to be approximately 94%–100%. Cellular infiltrates and lung consolidation appear as hyperechoic comet tails or patchy patterns deep to the hyperechoic pleural surface. Severity of disease identified on ultrasound has been reported to correlate with lesions found at necropsy.

Treatment and prevention

- Antimicrobials
- Supportive treatment
- The treatment focuses on the use of antimicrobials to control secondary bacterial pneumonia. There is no specific treatment for viral interstitial pneumonia. Supportive treatment and correction of dehydration may be necessary.
- Killed and modified live virus vaccines are available in injectable and intranasal formats.
- Prevention of bovine respiratory disease should focus on reducing the stress factors that contribute to its development.

Conclusions

- BRSV and Pi3 are important pathogens in cattle and related to outbreaks of respiratory disease. The two viruses share a lot of morphological and biological characteristics between each other. Intense studies on BRSV and Pi3 have not only lead to the development of vaccines for use in cattle, but also improved our understanding of the disease in cattle. Based on this knowledge, we can conclude that the viruses BRSV and Pi3 are only two out of multiple factors that lead to BRD.
- Especially in some of our production systems where we assemble high numbers of calves from various sources under stressful conditions, the BRD problem can only be solved by a holistic approach in which systematic vaccinations programs, preferably also at the herd of origin are supported by state-of-the-art herd management and biosecurity measures