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Current Approach to Bovine Respiratory Disease

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Abstract

Bovine Respiratory Disease (BRD) is a multi-factorial disease resulting from the interaction of bacterial and viral agents, usually in combination with stress. BRD is a major health problem of cattle worldwide and is also a disease of economic importance to the cattle industry. One of the challenges of bovine respiratory medicine is early detection of clinical cases of BRD. This is especially important in subclinical forms of the disease, which can be easily missed and cause important economic losses. Also, the preventative approaches to the disease are not enough. In this article, basic characteristics and current diagnosis, treatment and prevention approaches of BRD were reviewed.

Keywords: Bovine Respiratory Disease; Fibrinogen; Haptoglobin; Nitric Oxide Releasing Solution

Abbreviations: BRD: Bovine Respiratory Disease; BHV: Bovine Herpes Virus Type; BRSV: Bovine Respiratory Syncytial Virus; BVDV: Bovine Viral Diarrhoea Virus; PI3: Parainfluenza-3 Virus; APP: Acute-Phase Proteins; Fb: Fibrinogen; Hp: Haptoglobin; SAA: Serum Amyloid A; CRP: C-reactive Protein; NORS: Nitric Oxide Releasing Solution

Introduction

Bovine Respiratory Disease (BRD) is a multi-factorial disease, usually resulting from the interaction of bacterial and viral agents, combined with stress factors [1] such as weaning, transportation, pooling of cattle from multiple sources, dusty conditions, parasitism, concurrent diseases and weather extremes and environmental factors ultimately resulting in bronchopneumonia [2,3]. The viral pathogens associated with BRD include bovine herpesvirus type 1 (BHV-1), parainfluenza-3virus (PI3), bovine viral diarrhoea virus (BVDV), and bovine respiratory syncytial virus (BRSV). In addition, bacterial pathogens associated with BRD are *Mannheimiahaemolytica, Mycoplasma bovis, Pasteurellamultocida and Histophilussomni* [3].

BRD continues to be one of the most common animal health concerns in commercial feedlot production, and can result in significant economic losses [4]. BRD is causing approximately 75% of the morbidity and over 50% of the mortality in feedlots [5]. It is estimated that BRD is responsible for the loss of more than one million animals and approximately US $700 million annually [6]. In addition, at least $23.60 has been spent per treated calf [3].

One of the challenges of bovine respiratory medicine is early detection of clinical cases of BRD. This is especially important in subclinical forms of the disease, which can be easily missed and cause important economic losses [7]. It is generally accepted that early recognition and treatment of BRD improves both prognosis and outcome, while delayed diagnosis and treatment may result in treatment failure [4].

Especially, respiratory disease of young dairy calves is a significant cause of morbidity, mortality, economic loss, and animal welfare concern but there is no gold standard diagnostic test for antemortem diagnosis [8].

Diagnosis of BRD

Clinical examination

The clinical diagnosis of BRD classically is based on clinical signs [7]. These signs which are used to make a diagnosis of respiratory disease of calves are fever, cough, ocular or nasal discharge, abnormal breathing, and auscultation of abnormal lung sounds [8]. Different practical tools have been developed for researchers and producers for both beef and dairy calves [7].

Love WJ evaluated clinical scoring systems for BRD. There are some different clinical scoring systems for BRD. The first system values are coughing (induced or spontaneous coughing, 2 points), nasal discharge (any discharge, 3 points), ocular discharge (any discharge, 2 points), ear and head carriage (ear droop or head tilt, 5 points), fever (≥39.2 °C or 102.5 °F, 2 points), and respiratory quality (abnormal respiration, 2 points). Calves are categorized "BRD positive" if their total score is ≥4. This system correctly classified 95.4% of positive cases and 88.6% of controls. The second presented system categorized the predictors and assigned weights as follows: coughing (spontaneously, 2 points), mild nasal discharge (unilateral, serous or watery discharge, 3

points), moderate to severe nasal discharge (bilateral, cloudy, mucoid, mucopurulent, or copious discharge, 5 points), ocular discharge (any discharge, 1 point), ear and head carriage (ear droop or head tilt, 5 points), fever (≥39.2 °C, 2 points), and respiratory quality (abnormal respiration, 2 points). Calves were categorized "BRD positive" if their total score is ≥4. This system correctly classified 89.3% of positive cases and 92.8% of controls. The third presented system using the following predictors and scores: coughing (spontaneous only, 2 points), nasal discharge (any, 4 points), ocular discharge (any, 2 points), ear and head carriage (ear droop or head tilt, 5 points), fever (≥39.2 °C, 2 points), and respiratory quality (abnormal respiration, 2 points). Calves are categorized "BRD positive" if their total score is ≥5. This system correctly classified 89.4% of positive cases and 90.8% of controls. Each of the proposed systems offers few levels of clinical signs and data-based weights for on-farm diagnosis of BRD in dairy calves [6].

Auscultation examination

Normally, the thorax of each calf is systematically scanned in each intercostal space from the 11th to the 4th and it is divided into 3 equal longitudinal regions (Figure 1): dorsal, middle, and ventral [9]. If the veterinarian is focus on enzootic bronchopneumonia, she/he should concentrate on the middle and ventral parts of the thorax. Because bovine bacterial bronchopneumonia usually occurs in these locations. The medium and ventral parts of the right (r) and left (l) thorax then are divided into 4 quadrants (Ar/Br/Cr/Dr and Al/Bl/Cl/Dl) that are auscultated using a stethoscope (Figure 1). The presence of abnormal lung sounds including crackles, wheezes, and pleural friction rubs and the absence of respiratory noises should be recorded as abnormal [7].

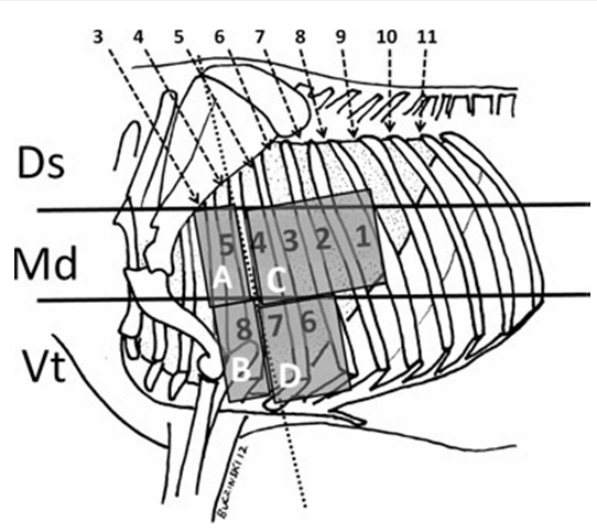

Figure 1: Thoracic ultrasonographic and auscultation sites used in pre-weaned calves. Sites 1-8: Ultrasonographic sites at which thoracic examination needed performed systematically. The median (Md) to ventral (Vt) parts of the thorax are divided into 4 auscultation areas (A-D) [7].

Ultrasonographic examination

Buczinski S have reported the detailed ultrasonographic examination technique in calves with BRD as indicated below. Thoracic ultrasonography has been previously mentioned as a non-invasive ancillary tool for assessing lung lesions and can give information that is complementary to more classical lung function tests (blood gas analysis or spirometric measures). Thoracic ultrasonography has been shown to be highly correlated with radiographic and necropsy lesions [9]. It can be done easily on calf, and therefore has the potential to be used by bovine practitioners and researchers in field conditions [7].

The same area that is auscultated systematically scanned from the 8th to the 4th intercostal space for enzootic pneumonia for use ultrasonographic examination (Figure 1). A total of 8 sites for each side of the thorax are screened for the presence of abnormal ultrasonographic findings. Ultrasonography can performed using a 8.5MHz linear probe that is directly applied on the thorax after 70% isopropyl alcohol could sprayed on the area of interest to improve image quality without clipping. The different anomalies should be noted the presence of comet-tail artefacts (COMT) [7].

Laboratory tests

Whole blood and nasal swab samples, nasopharyngeal swab and bronchoalveolar lavage fluid can use for detection of BRD agents with PCR and ELISA techniques [2,5,10]. But periodical monitoring of the infectious agents is not practical, also expensive for a lot of farm.

To improve diagnostic accuracy, several authors have focused on ancillary tests using various blood biomarkers. For example, the acute-phase proteins (APP) change in concentration after infection, inflammation, surgical trauma, or stress and can either increase (positive APP) or decrease (negative APP) as a consequence of inflammatory stimuli before the clinical signs. Haptoglobin (Hp), serum amyloid A (SAA), and fibrinogen (Fb) are among the most commonly reported APPs. The C-reactive protein (CRP) has also been mentioned in various species (eg, human or dog) as an important APP but has received limited interest in cattle. The serum increase of APPs can occur as soon as 4 hours after the insult for SAA and CRP or later (24-48 hours) for Hp and Fb [11].

Treatment of BRD

Antimicrobial agents are primarily used to reduce the incidence and severity of BRD, and various registered antibiotics are available for its treatment. Ampicillin, erythromycin, tetracycline, spectinomycin, sulfamethazine, gamithromycin, florfenicol, and tulathromycin are anti-microbial agents commonly used in the treatment of BRD [1,12]. They are generally administered by the oral and/or parenteral routes. However, these treatment applications have several important disadvantages such as systemic side effects, irritation at the injection site, and withdrawal times before slaughtering or

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milking of animals for human consumption [13]. In addition, developing antibiotic resistance risk of some pathogens is increasing [14]. Joshi have applied relatively new treatment technique for BRD with nebulization. The researchers reported that nebulisation of sodium ceftiofur has more effective treatment when compared with intramuscular injection of the antibiotic in calves with BRD under field conditions.

Prevention

Unfortunately, routine screening of calves for respiratory disease on the farm is rarely performed [8]. The vaccines available to prevent BRD continue to improve [15]. In addition, a nitric oxide releasing solution (NORS) has been developed and shown to have potential in the prevention of BRD [16]. In the other hand, purchasing single-source cattle which known history of pre- and post-weaning procedures can minimize pathogen exposure and enhance immunity. Using cattle-handling techniques and facilities that promote low stress will allow host immune defences to remain effective against bacterial and viral colonization. Also, controlling BRD must be managed through a comprehensive herd health immunization and management program that effectively addresses disease challenges common to the operation [17,18].

Conclusion

In conclusion, BRD is still an important topic and seems to will be serious problem for cattle industry some more time because of its complex etiological structure, difficulties of early diagnostic and treatment situations. One of the negative parts of the situation is improving antibiotic resistance of the pathogens; therefore treatment alternatives are getting decrease. In this frame, prevention and early diagnose of BRD have more importance for future of the cattle industry worldwide.

References

1. Arslan HH, Yavuz O, Nisbet C, Cenesiz S, Saripinar Aksu D (2010) Comparative evaluation of the effects of florfenicol and tulathromycin on clinical recovery and acute phase proteins in undifferentiated natural bovine respiratory disease. Revue Med Vet 161(12): 535-539.
2. Klima CL, Zaheer R, Cook SR, Booker CW, Hendrick S, et al. (2014) Pathogens of bovine respiratory disease in North American feedlots conferring multidrug resistance via integrative conjugative elements. J Clin Microbiol 52(2): 438-448.
3. Grissett GP, White BJ, Larson RL (2015) Structured literature review of responses of cattle to viral and bacterial pathogens causing bovine respiratory disease complex. J Vet Intern Med 29(3) :770-780.
4. Abutarbush SM, Pollock CM, Wildman BK, Perrett T, Schunicht OC, et al. (2012) Evaluation of the diagnostic and prognostic utility of ultrasonography at first diagnosis of presumptive bovine respiratory disease. Can J Vet Res 76(1): 23-32.
5. Rodriguez-Castillo JL, Lopez-Valencıa G, Monge-Navarro FJ, Medina-Basulto GE, Hori-Oshima S, et al. (2017) Detection and economic impact related to bovine respiratory disease, shrink, and travelling distance in feedlot cattle in Northwest Mexico. Turkish Journal of Veterinary and Animal Sciences 41: 294-301.
6. Love WJ, Lehenbauer TW, Kass PH, Van Eenennaam AL, Aly SS (2014) Development of a novel clinical scoring system for on-farm diagnosis of bovine respiratory disease in pre-weaned dairy calves Peer J 2: e238.
7. Buczinski S, Forte G, Francoz D, Belanger AM (2014) Comparison of thoracic auscultation, clinical score, and ultrasonography asindicators of bovine respiratory disease in preweaned dairy calves. J Vet Intern Med 28(1): 234-242.
8. McGuirk SM, Peek SF (2014) Timely diagnosis of dairy calf respiratory disease using a standardized scoring system. Anim Health Res Rev 15(2): 145-147.
9. Buczinski S, Forte G, Bélanger AM (2013) Short communication: ultrasonographic assessment of the thorax as a fast technique to assess pulmonary lesions in dairy calves with bovine respiratory disease. J Dairy Sci 96: 4523-4528.
10. Capik SF, White BJ, Lubbers BV, Apley MD, DeDonder KD (2017) Comparison of the diagnostic performance of bacterial culture of nasopharyngeal swab and bronchoalveolar lavage fluid samples obtained from calves with bovine respiratory disease. Am J Vet Res 78(3): 350-358.
11. Abdallah A, Hewson J, Francoz D, Selim H, Buczinski S (2016) Systematic Review of the Diagnostic Accuracy of Haptoglobin, Serum Amyloid A, and Fibrinogen versus Clinical Reference Standards for the Diagnosis of Bovine Respiratory Disease. J Vet Intern Med 30(4): 1356-1368.
12. Miller T, Hubbert ME, Schwandt EF, Thomson DU, Reinhardt CD (2017) Differences in Efficacy Between Gamithromycin, Tilmicosin, and Tulathromycin as Metaphylactic Treatments in High Risk Calves for Bovine Respiratory Disease. Kansas Agricultural Experiment Station Research Reports 3(1): 11.
13. Joshi V, Gupta VK, Dimri U, Kumar OV, Sharma DK, et al. (2017) Assessment of nebulisation of sodium ceftiofur in the treatment of calves naturally infected with bovine respiratory disease. Trop Anim Health Prod 49(3): 497-501.
14. DeDonder KD, Apley MD (2015) A literature review of antimicrobial resistance in Pathogens associated with bovine respiratory disease. Animal health research reviews 16(2): 125-134.
15. Hilton WM (2014) BRD in 2014: where have we been, where are we now, and where do we want to go? Animal Health Research Reviews, 15(2):120-122.
16. Sheridan MP, Regev-Shoshani G, Martins J, Vimalanathan S, Miller C (2016) Nitricoxide modulates the immunological response of bovine PBMCs in an in vitro BRDc infection model. Research in Veterinary Science 109: 21-28.
17. Edwards TA (2010) Control Methods for Bovine Respiratory Disease for Feedlot Cattle. Vet Clin North Am Food Anim Pract 26(2): 273-284.
18. Lee CR, Kim KY, Kim CN, Park DU, Roh JH (2005) Investigation of concentrations and correlations of airborne microbes and environmental factors in the general hospital. J Kor Soc Occup Environ Hyg 15: 45-51.

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