



## Review on Clinical Management Involving Respiratory Diseases in Ruminants

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**Abstract** | Respiratory system disease is one of the most common problems of ruminants worldwide and has been classified as one of the costliest diseases. Diseases involving respiratory system in small and large ruminants can be caused by virus, bacteria and fungi. These disorders may lead to reductions in both production and economic gains. The most important diagnostic tool in diagnosing respiratory diseases is through general evaluation of the patient and the herd history. The common clinical signs and responses of animals infected with respiratory diseases are presence fever (pyrexia), loss of appetite, nasal discharge (serous or mucoid), coughing, sneezing, showing signs of difficulty in breathing (dyspnea), and abnormal lung sound upon auscultation where this will allow to score the different severity status of pneumonia. Lung auscultation scoring is essential in diagnosing respiratory disease and is a systematic approach method that could be adopted to detect, identify and differentiate the degree of severity in ruminant pneumonia cases that will aid in clinical management of the disease during drafting the treatment plan or therapeutic regime. There is a limited review on clinical management of respiratory diseases involving ruminants. Hence, this review aims at focusing on the clinical management of common respiratory diseases involving ruminants. Therefore, this review may enlighten the field veterinarians on the common respiratory diseases of small and large ruminants and its clinical management.

**Keywords** | Clinical Management, Respiratory, System, Clinical, Diseases, Condition, Ruminants.

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## INTRODUCTION

Diseases involving respiratory system in small and large ruminants can be caused by various etiological agents such as virus, bacteria, fungi etc. Chakraborty et al. (2014) stated that about 5.6 percent of respiratory system diseases are contributed by infectious agents and it can be further divided into two which are upper respiratory tract disorders and lower respiratory tract disorders. This disease will cause loss and has been classified as one of the costliest diseases

throughout the world due to animal death, high treatment cost, or reduced performance of the affected animals (Griffin, 1997; Fulton, 2009). Environment such as hot and humid such as in Tropics region provides optimal condition for these infections to occur in ruminants, especially for small ruminants (goats and sheep) where highly vulnerable to the risk of respiratory diseases (Kumar et al., 2014) and approximately 50% of mortality among the small ruminants are due to respiratory diseases. Tropical region such as in Malaysia, the main causative pneumonia infection

among small ruminants are the bacterial infection caused by *Pasteurella sp.* or *Mannheimia sp.* (Chung et al., 2015). There are also other contributing stressors factors towards occurrence of this disease such as transportation, climatic changes, new environment or feed, poor management and nutrition and high stocking density (Zamri-Saad et al., 1994; Brogden et al., 1998; Chung et al., 2015).

The most important diagnostic tool in diagnosing respiratory diseases is through general evaluation of the patient. The first step of diagnosis when a patient was presented with primary complaint of respiratory problem, is to obtain accurate and appropriate history (Large Animal Internal Medicine, 5<sup>th</sup> Edition). Herd history which includes the patient signalment, general evaluation of patient by observing the presenting signs and thorough physical examinations are part of disease investigation process and management (Plummer et al., 2012). The observation and scoring of the severity of clinical signs are essential in clinical management. The common clinical signs and responses of animals infected with respiratory diseases are presence fever (pyrexia), loss of appetite, nasal discharge (serous or mucoid), coughing, sneezing, showing signs of difficulty in breathing (dyspnea), and abnormal lung sound upon auscultation where this will allow to score the different severity status of pneumonia (Maria, 2007; Mohamed and Abdelsalam, 2008). According to Mohamed and Abdelsalam (2008), animals infected with respiratory disease are often presented with fever, dyspnea, crackles to harsh lung sound, cough, and nasal discharges. Lung auscultation scoring is essential in diagnosing respiratory disease because it helps to determine the severity of the disease and helps in clinical management of the disease during drafting the treatment plan or therapeutic regime. Lung auscultation scoring method is a systematic approach that could be adopted to detect, identify and differentiate the degree of severity in ruminant pneumonia cases (Jesse et al., 2018).

Antimicrobial therapy has been and remains as the basis of treatment for ruminant respiratory disease for many decades. There are farms still using Oxytetracycline and Sulfa as antibiotic of choice as these drugs are cheaper and more affordable compared to other choice of antibiotics (Heather Thomas, 2009). Lorenz et al. (2011) stated that to ensure the effectiveness of the choice of antimicrobial drugs being used, the disease must be diagnosed and treat earlier using correct dosage of drug, route of administration and duration. The use of anti-inflammatory drugs such as Flunixin in combination with antibiotic is recommended as a choice in the therapeutic plan of respiratory system disease (Simon, 2005). Anti-inflammatory medication will help in the reduction of inflammatory process, pain and pyrexia (fever) in the affected animals (Lorenz et al., 2011).

There is a lack of reviews and gathered information on clinical management involving diseases of respiratory system in ruminants. Therefore, this review paper aims to on common respiratory system diseases in ruminants and its clinical signs, common drug opted for its treatment and the correlation with the effectiveness and successful rate in curing the disease from the adopting the therapeutic regime. This additional information from this review may assist field veterinarians on improving the clinical management of this respiratory disease involving small and large ruminants in future.

### ANATOMY OF RUMINANT'S RESPIRATORY SYSTEM

The respiratory system is one of the important body systems that help in the process of oxygen delivery to various parts of the body and removal of carbon dioxide, and these gases movements in and out of the body are done through the lungs. The transportation of gas is vital to allow gaseous exchange between inhaled air and the blood that flows within the body circulation. (Anatomy and Physiology of Farm Animals 7<sup>th</sup> Edition). The nose, nasal cavity, pharynx, larynx and trachea are part of the upper respiratory tract. Sinusitis, nasal foreign bodies, and nasal neoplasms are among the problems involving the upper respiratory tract. Apart from that, traumatic injury to the mucosal layer of respiratory tract due to improper use of equipment may possibly result in bacterial infection and formation of abscesses (Heather Thomas, 2009). The trachea, bronchi, bronchioles, lungs, and pleura are part of the lower respiratory tract of the system. Pneumonia is the most common respiratory problem associated with the lower respiratory tract (Heather Thomas, 2009). Bacteria, viruses, or parasites are among the common causative agents of pneumonia. Depending on the primary cause of pneumonia, it can become either acute or chronic infection (Heather Thomas, 2009).

### DEFINITION OF DIFFERENT TYPES OF RESPIRATORY DISEASE IN RUMINANTS

Respiratory diseases are illnesses involving the respiratory system due to several pathological changes to the either the tract or organs involved. Impaired function of the organs and tissues will affect the air passage and quality of life for the animal. Generally, ruminant animal of any age and species are susceptible to respiratory diseases. Young animals at the age of 6 months onwards have higher incidence and risk of disease compared to adult due to declining maternal antibodies. Small ruminants especially are highly vulnerable to risk of respiratory diseases (Kumar et al., 2014).

Respiratory diseases in ruminants can be caused by infectious and non-infectious agents such as viruses, bacteria, parasites, foreign irritants, injury to respiratory tract and many more. Common pathogens that contributes to the respiratory diseases in ruminants are *Pasteurella spp.*, *Man-*

*nheimia* spp., *Mycoplasma*; Parainfluenza III virus (PI3), Infectious Bovine Rhinotracheitis (IBR), Bovine Viral Diarrhoea Virus (BVDV) (Magstadt et al., 2018). Depending on the types of pathogen and appearance of clinical signs, respiratory tract infection may be divided into upper airway disease and lower respiratory disease (Barac et al., 2018). Upper Respiratory Tract Infection (URTI) is normally not a life-threatening condition and it involves the upper part of the respiratory tract which includes the nose, nasal cavity, pharynx, larynx and trachea. Upper airway diseases are often accompanied with distinctive feature or signs such as stertor and stridor, sneezing, and nasal discharge. Some of the common diseases of URTI are such as enzootic nasal adenocarcinoma, retropharyngeal lymph node abscessation, rhinitis, sinusitis, laryngitis, and tracheitis (Plummer et al., 2012). According to Heather Thomas (2009), URTI becomes life threatening when the animal's defense system is impaired or weakened, and this forms an ideal condition for pneumonia. Most often URTI involves temporary inflammation of the nostrils, throat, and windpipe. Animals may start showing signs of nasal discharge with no other severe symptoms, and maybe cough when there is inflammation of the windpipe, together with mild fever, reduced appetite and dullness (Heather Thomas, 2009). Sinusitis is a part of upper respiratory tract infection, involving the sinus. This condition rarely occurs, but normally happens post-dehorning in goats and sheep. Apart from dehorning infection, sinus infection could also happen when there are dental abnormalities. Presented signs of sinusitis include drainage from dehorning sites, abnormalities of the facial bones with presence of swelling; the animals may also show systemic signs such as fever, inappetent and lethargy (Plummer et al., 2012).

Pneumonia is a disease associated with the lower respiratory tract, mainly involving the lungs. The infection often started from the upper tract and progress downwards into the lungs. Pneumonia is often more severe than an upper respiratory tract infection, and it is more life threatening as well (Heather Thomas, 2009). Animals of any age can be infected with pneumonia disease. The causative agent for pneumonia varies and it may be due to irritants that causes damage to respiratory tract lining, viruses, bacteria's, environmental factor, and anything that causes the animal to have drop in immunity (Plummer et al., 2012). Pyrexia, inappetence, dull and depression, lethargy with droopy ears, dyspnea and tachypnea, evidence of eye and nasal discharges are the common clinical signs of animal succumb with pneumonia (Heather Thomas, 2009).

Animals are easily can be infected with bacterial pneumonia when the stress-triggering factors such as weather changes, transportation, overcrowding, nutritional deficiency and other factors that causes immune suppression affecting the particular animal. Severe progressive bacterial

pneumonia infection is fatal to the affected animal because it causes severe lung damage if left untreated for a long period of time (Plummer et al., 2012). Viral pathogens such as infectious bovine rhinotracheitis (IBR), parainfluenza III (PI3), Respiratory Syncytial Virus (RSV) or Bovine Viral Diarrhoea (BVD) in cattle, and Blue Tongue Virus in small ruminants often causes respiratory diseases with mild illness signs (Plummer et al., 2012). Combination pneumonia infection involving virus or bacteria, it often causes a severe and fatal disease in the affected animals (Duncanson, 2012).

Aspiration pneumonia is categorized under non-infectious conditions of the lower respiratory tract infection and this condition occurs when significant amounts of feedstuff or liquids being inhaled leading to intense inflammatory response (Plummer et al., 2012). The severity and prognosis are very much depending on the amount of material inhaled. Broad-spectrum antibiotics and anti-inflammatory drugs can be use as part of the treatment regime in aspiration pneumonia cases in ruminants (Duncanson, 2012). In small ruminants one of the common disease causes formation of abscesses in external and internal lymph nodes and visceral organs named as Caseous Lymphadenitis (CLA) caused by *C. pseudotuberculosis* may affect the lymph nodes involving respiratory system (thoracic lymph node) and affected animals normally will exhibit signs of dyspnea, tachypnea, chronic coughing and weight loss (Plummer et al., 2012).

In Tropics particularly for Malaysia the common respiratory disease in ruminants is pneumonia. The common bacterial respiratory infections in small ruminants are due to *Pasteurella sp.* or *Mannheimia sp.* with high prevalence of clinical cases recorded (Chung et al., 2015). In large ruminants, the bovine respiratory diseases are often associated with bacterial pneumonia caused by *Mannheimia haemolytica* serotype 1 and *Pasteurella multocida*. These pathogens are normal floras that are present in the upper respiratory tract and these opportunistic pathogens tend to proliferate and become infectious when the host is immunosuppressed (Barac et al., 2018).

### CLINICAL MANAGEMENT OF RESPIRATORY DISEASE IN RUMINANTS.

The management of respiratory diseases is not different from other diseases. Herd history which includes the patient signalment, general evaluation of patient by observing the presenting signs and thorough physical examinations are part of disease investigation process and management (Plummer et al., 2012). Respiratory diseases are normally diagnosed by evaluating the patient's condition and getting accurate herd history (Large Animal Internal Medicine, 5<sup>th</sup> Edition). Plummer et al. (2012) stated that the



most important component of making a diagnosis or evaluation is by performing a thorough and unbiased physical examination on animals presented with abnormalities of respiratory tract. We may miss the important primary or secondary physiologic problems without a complete physical examination. Thus, it will affect the diagnostic plan which becomes incomplete; in turn it'll be hard to obtain a definitive diagnosis. A systematic physical examination that includes all parts of the respiratory system must be conducted (Plummer et al., 2012) and observing the animal's behavior, resting respiratory rate and pattern should be done prior to approach or restraining. This observation should be done from a distant to prevent the animal from becoming stress because this would affect the physiology parameters that will be taken as measuring record. The detailed evaluation of the respiratory system should start from head followed by the nares in order to determine presence of nasal discharge and patency. Examination and palpation local lymph nodes' involving respiratory system is essential to determine the systematic involvement (Plummer et al., 2012).

Diagnosis of respiratory disease may not require advance diagnostic tools, just by lung auscultation may help in determining whether the animal is having pulmonary-related problem or not (Maria, 2007; Mohamed and Abdelsalam, 2008). Complete auscultatory examination of the thoracic region must be performed (Plummer et al., 2012) and lung auscultation scoring is essential in diagnosing respiratory disease because it helps to determine the severity of the disease. Lung auscultation scoring method is a systematic approach that could be adopted to detect, identify and differentiate the degree of severity in ruminant pneumonia cases (Jesse et al., 2018). Respiratory problem is evident when abnormal respiratory sounds such as harsh, wheezes or crackles lung sound is heard during auscultation.

Rectal temperature is essential to determine whether there is any involvement of inflammatory process causing pyrexia (Chung et al., 2015). Veterinarians should also observe and evaluate the animal housing environment as Plummer et al. (2012) stated that environment plays an important role in the development of respiratory disease where animals are predisposed to respiratory disease when housed in poorly ventilated environment or highly stocked house. Definitive diagnosis of the causative agent of the respiratory disease can be obtained through further laboratory diagnostic work-up such as bacteriology culture, isolation and identification of the causative agent (Chung et al., 2015). Respiratory disease in ruminants can be successfully treated depending on the primary cause of the disease (Plummer et al., 2012). Heather Thomas (2009) suggested the use of systemic antibiotics (Oxytetracycline and Sulfa combination, or any broad-spectrum antibiotic) to stop further infection and anti-inflammatory (Dexamethasone,

Flunixin meglumine, or dimethyl sulfoxide) to reduce pain and swelling that will help the affected animal to be able to swallow and breathe. In most cases involving bacterial infection, early identification of causative bacteria and sensitive antibiotics will increase the effectiveness of treatment (Ramasam, 2018). Pneumonia is effectively treated with antimicrobial drugs such as Penicillin, Ampicillin, Tetracycline, Oxytetracycline, Tylosine, Flornifecol, and Ceftiofur (Maria, 2007; Plummer et al., 2012). According to Steeg (2011), early and aggressive treatment must be done using antibiotics and NSAIDs to ensure high chance of recovery. In a study done by Chung et al. (2015), stated that rehydration in dehydrated pneumonic animal through intravenous fluid administration can be adopted part of the therapeutic plan in treating a pneumonic pasteurellosis clinical case. Keeping the affected animal in a comfortable condition and minimizing stress will help in the prognosis of the clinical case together with proper therapeutic regime of treatment (Heather Thomas, 2009).

## CONCLUSION

In conclusion, respiratory infections in ruminants are associated with economic losses due to high morbidity and mortality, incurred costs on treatment and prevention programs and reduced performance in production (Griffin, 1997; Fulton, 2009). The prevalence of disease remains high despite the act of disease control had been taken as the complexity of the disease. The good management of nutrition of the animals and environmental factors will help in the prevention occurrences of clinical case (Steeg, 2011). Timely and correct clinical diagnosis and with good therapeutic regime for clinical case involving respiratory disease in ruminants will help in the prognosis of the case and also increase chances curing the disease (Jesse et al., 2018).

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## CONFLICT OF INTEREST

None to declare

## AUTHORS CONTRIBUTION

**Jesse Faez Firdaus Bin Abdallah:** Conceptual frame work. **Hanim Nur Abdul Mubin, Idris Umar Hambali, Mohd-Azmi Mohd Lila, Chung Eric Lim, Iiamai Bitrus, Asinamai Athliamai Bitrus, Abba Yusuf, Innocent Damudu Peter and Jefri Mohd Bin Norsidin:** Assisted in

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