Face2Vet
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For Vet Professionals Only

INTAS ANIMAL HEALTH
Wishes You a Happy Diwali
May this festival bring joy and happiness, in caring for animal health

Bovine Pneumonia

Every Breath Matters

Dear Vets,

Efficient respiratory function is fundamental to the healthy life of all animals. Respiratory diseases remain the most economically important disease affecting dairy animals, with pneumonia representing a major contributor to morbidity and mortality. The disease can affect animals of all ages although young animals in intensively managed herds are particularly vulnerable. The consequences extend beyond clinical illness, influencing performance, milk production, reproductive efficiency and overall herd profitability.

Bovine pneumonia is not a result of single pathogen but it involves combined effects of bacterial and viral infections, environmental challenges and management associated stress. Poor housing conditions, transportation, weaning stress, mixing of animals and nutritional imbalances can compromise immunity and increase the likelihood of respiratory infections. Once immunity is impaired, pathogens gain opportunity to invade respiratory tract, causing lung inflammation, tissue damage and impaired gas exchange.

This issue of Face2Vet, explores the key aspects of bovine pneumonia, including major causative agents, risk factors, disease mechanisms, diagnosis, treatment strategies and prevention. We invite you to read this issue and share your valuable feedback or thoughts by scanning the QR code below or by reaching us *via* email at face2vet@intaspharma.com.

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Introduction

Bovine pneumonia is recognized as one of the major health challenges affecting dairy animals. In India, its prevalence ranges from 15 - 30%, varying across regions, climatic zones, management systems, age groups and seasons. Higher incidence rates are commonly recorded in young animals and intensively managed dairy herds. Although the disease can occur throughout the year, it is most common during winter and monsoon seasons, when cold conditions, high humidity, poor ventilation and overcrowding create favourable conditions for pathogen survival and transmission.

Bovine pneumonia is a multifactorial disease resulting from complex interaction of infectious agents, environmental stressors, host immunity and management practices. Both bacterial and viral agents play important roles in disease development. Viral infections often compromise respiratory immune mechanisms, thereby facilitating colonization and proliferation of opportunistic bacteria within lungs, leading to severe respiratory illness.

Etiology

Bovine pneumonia is caused by complex interaction of infectious agents, and predisposing factors including host, environmental and managemental factors (Fig. 1 and 2).

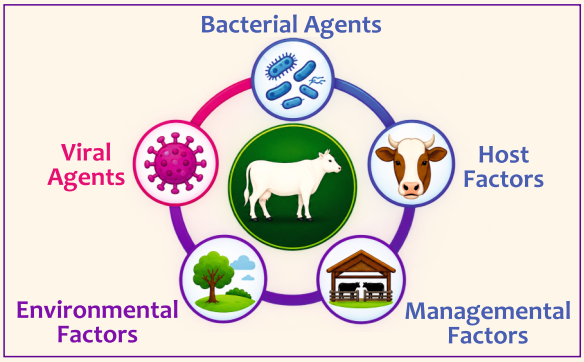
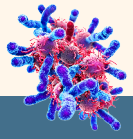
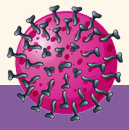


Fig. 1: Etiological Agents



- *Pasteurella multocida*
- *Histophilus somni*
- *Mannheimia haemolytica*
- *Mycoplasma bovis*
- *Mycoplasma bovirhinis*

Bacterial Agents and *Mycoplasma* spp.



- Bovine herpesvirus-1 (BoHV-1)
- Bovine respiratory syncytial virus (BRSV)
- Bovine parainfluenza virus type-3 (BPIV-3)
- Bovine viral diarrhea virus (BVDV)
- Bovine coronavirus (BCoV)
- Bovine adenovirus (BAV)
- Influenza C and D virus

Viral Agents

Fig. 2: Infectious Agents

Predisposing Factors

Various host, environmental and managemental factors are responsible for development of pneumonia in dairy animals, as shown in Table 1.

Table 1: Predisposing Factors of Bovine Pneumonia

Category	Factor	Role in Pneumonia Development
Host Factors	Young age and low body weight	Immature immune system and lower ability to cope with stress leads to increased disease susceptibility.
	Inadequate colostrum intake	Insufficient maternal antibodies results in poor passive immunity.
	Nutritional deficiencies	Deficiency of energy, proteins, vitamins and minerals impair immune function.
	Nervous/excitable temperament	Increased stress response suppresses immunity and disease resistance.
Environmental Factors	Sudden weather changes	Temperature fluctuations, especially cold stress impair immunity.
	Poor housing and ventilation	High humidity, poor air quality, dust and overcrowding favor pathogen transmission.
Managemental Factors	Transportation stress	Handling, overcrowding, feed and water deprivation suppress immunity.
	Mixing/introducing new animals	Social regrouping stress and exposure to new pathogens increase disease risk.
	Purchase through markets/sale barns	Repeated transport, overcrowding and mixing with animals from multiple sources enhance exposure and stress.
	Weaning stress	Separation from dam, dietary changes and adaptation stress reduce immune function.
	Stressful husbandry practices	Late castration and dehorning cause physiological stress and increase susceptibility.



Stress
Transport, handling



Poor Ventilation
Indaequate hygiene



Crowding
High density mixing

Fig. 3: Predisposing Factors (Storoni *et al.*, 2026)

Pathophysiology

- Bovine pneumonia develops when stressors such as transportation, weaning, overcrowding, mixing of animals, poor ventilation, climatic stress and nutritional deficiencies suppress immune function. Concurrent viral infections damage the respiratory tract and further impair host immunity (Fig. 4).

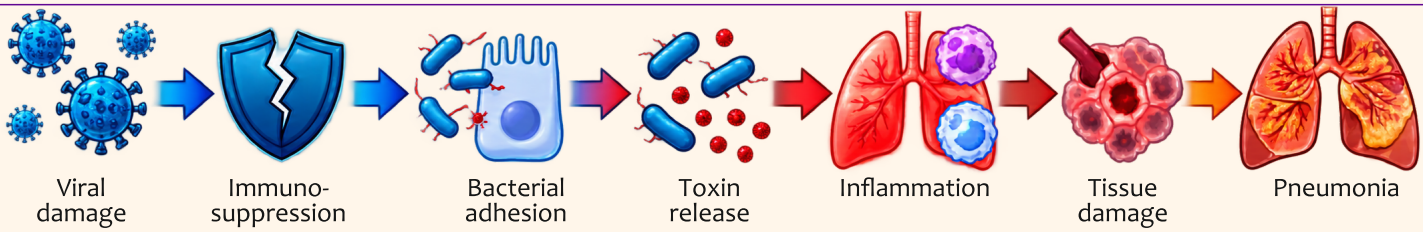


Fig. 4: Cascade of Viral, Immunological and Bacterial Events Leading to Pneumonia (Storoni *et al.*, 2026)

- Compromised pulmonary immune mechanisms allow bacteria to colonize, multiply and proliferate within respiratory tract.
- Opportunistic bacteria present in upper respiratory tract proliferate and invade the lower respiratory tract.
- Major bacterial pathogens involved are *Pasteurella multocida, Histophilus somni, Mannheimia haemolytica* and *Mycoplasma bovis*.
- These bacteria release toxins and stimulate a strong inflammatory response within lungs.
- Accumulation of inflammatory cells, fluid, fibrin and cellular debris causes lung tissue damage and consolidation.
- Pleuritis, pulmonary edema, tissue necrosis and pneumonia develop as the disease progresses.
- Impaired gas exchange in lungs results in respiratory distress and reduced oxygen supply to body tissues.
- Clinical manifestations such as pyrexia, depression, nasal discharge, coughing, difficulty in breathing, reduced feed intake, decreased productivity and sometimes death become evident.

Classification of Pneumonia

Pneumonia in animals can be classified into various types based on underlying etiological agents, nature and distribution of lung lesions and pathological changes (Table 2).

Table 2: Morphological Classification of Pneumonia

Types	Etiology	Clinical Signs and Lesions
Suppurative Bronchopneumonia	*Pasteurella multocida*, secondary bacterial infections and post-viral BRD complex	Depression and toxemia (Fig. 5), pyrexia, cough, dyspnea, mucopurulent exudate in bronchi, cranioventral lung consolidation, firm lungs; in chronic cases may show bronchiectasis and abscessation.
Fibrinous Bronchopneumonia	*Mannheimia haemolytica* and *Histophilus somni*	High fever, marbled lung appearance, fibrin deposition in interlobular septa, fibrinous pleuritis, pleural adhesions and sudden death in severe cases.
Caseonecrotic Bronchopneumonia	*Mycoplasma bovis*	Chronic cough, poor growth, treatment resistant pneumonia and firm nodular lungs containing multiple yellow caseous foci.
Interstitial Pneumonia	Lush pasture associated 3-methylindole toxicity, hypersensitivity reactions, toxic plants, chemicals and BRSV infection	Acute respiratory distress (Fig. 6), extended head and neck, open-mouth breathing, enlarged non-collapsing lungs, pulmonary edema, emphysema, alveolar epithelial hyperplasia, rubbery lungs and checkerboard appearance may occur in feedlot cases.

Aspiration Pneumonia	Aspiration of rumen contents, milk, drenches, oral medications and faulty stomach tubing	Usually unilateral, foul-smelling necrotizing pneumonia, cavitary lesions containing feed material and fibrinopurulent pleuritis.
Metastatic Pneumonia	Hematogenous spread of septic emboli from liver abscesses, mastitis, metritis, endocarditis and thrombophlebitis	Multiple randomly distributed pulmonary abscesses, pulmonary hemorrhages, fever, dyspnea, pulmonary embolism, pulmonary aneurysm and hemoptysis (Fig. 7) in advanced cases.
Verminous Pneumonia	*Dictyocaulus viviparus* (lungworm)	Persistent coughing, respiratory distress, caudodorsal wedge shaped lesions and mucus filled bronchi containing adult worms.
Tuberculous Pneumonia	*Mycobacterium bovis*	Chronic wasting, granulomatous nodules (tubercles), caseous lesions, enlarged bronchial and mediastinal lymph nodes.



Fig. 5: Depression and Toxemia in Suppurative Bronchopneumonia
(Pierson and Kainer, 1980)

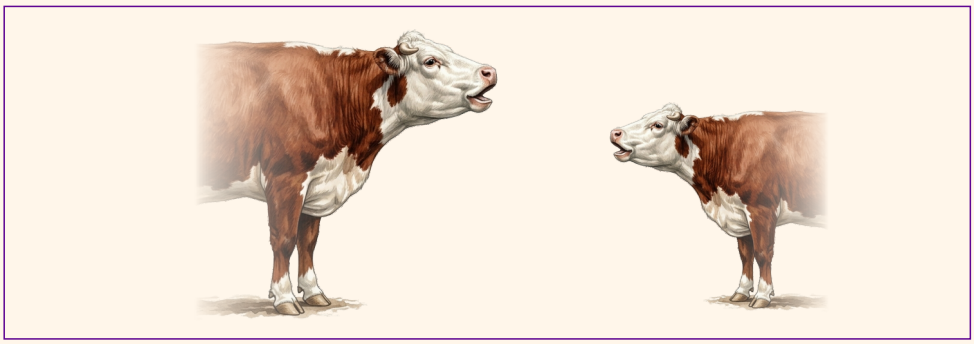


Fig. 6: Acute Respiratory Distress in Interstitial Pneumonia
(Pierson and Kainer, 1980)



Fig. 7: Hemoptysis in Metastatic Pneumonia
(Pierson and Kainer, 1980)

Clinical Signs

Clinical manifestations of pneumonia vary with causative agent, severity, duration of infection and age of animal (Table 3).

Table 3: Clinical Signs of Pneumonia

General Clinical Signs	Respiratory Signs
• Pyrexia • Depression and lethargy; affected animals appear dull, reluctant to move and often separate themselves from herd • Decreased feed and water intake • Weight loss and poor growth rate in chronic cases • Drop in milk production	• Coughing, initially dry and painful, becoming moist and productive as disease progresses • Increased respiratory rate (tachypnea) • Dyspnea (difficulty in breathing), often characterized by shallow abdominal respiration with extension of head and neck • Nasal discharge, which may be serous, mucoid, mucopurulent, or purulent depending on disease severity • Open-mouth breathing and nostril flaring in severe respiratory distress • Abnormal lung sounds on auscultation, including crackles, wheezes and increased bronchial sounds

Diagnosis

- Diagnosis of pneumonia can be made based on history of recent transportation, weaning, introduction of new animals in herd, overcrowding, poor ventilation, sudden weather changes or previous respiratory disease outbreaks.
- Presence of clinical signs including pyrexia, depression, anorexia, coughing, nasal discharge (Fig. 8), tachypnea, dyspnea and reduced milk production.



Fig. 8: Bullock Showing Bilateral Nasal Discharge (Jadhav *et al.*, 2020)

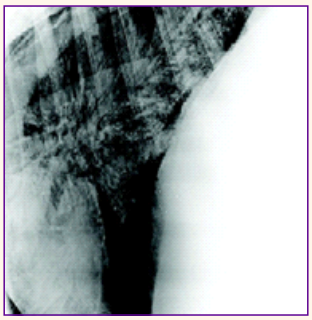


Fig. 9: Thoracic Radiograph Showing Caudal Lobe Interstitial Pneumonia (Jadhav *et al.*, 2020)

- Detection of abnormal respiratory sounds on auscultation, such as crackles (rales), wheezes, increased bronchial sounds, pleural friction rubs or diminished lung sounds over consolidated areas.
- Thoracic radiography is a key diagnostic tool for pneumonia which detects pulmonary lesions and their distribution, facilitating the diagnosis and differentiation of pneumonia types (e.g., caudal lobe interstitial pneumonia; Fig. 9) and aiding lesion localization and characterization.
- Hematological changes including leukocytosis and neutrophilia.
- Thoracic ultrasonography revealing lung consolidation, pleuritis, pleural effusion, pulmonary abscesses or fibrin deposits.
- Isolation and identification of respiratory pathogens through bacterial culture and anti-microbial susceptibility testing.
- Detection of specific bacterial and viral pathogens using molecular techniques such as PCR (polymerase chain reaction).

Treatment

Primary objectives of bovine pneumonia treatment include antibiotic therapy to control bacterial infection, anti-inflammatory therapy to reduce lung inflammation and supportive care to aid recovery.

Antimicrobial Therapy

- Commonly used antimicrobials for treatment of bovine pneumonia include fluoroquinolones (Enrofloxacin, Marbofloxacin and Orbifloxacin), β-lactam antibiotics (Amoxicillin, Ceftiofur, Cefquinome and Ceftriaxone), tetracyclines (Oxytetracycline), amphenicols (Florfenicol) and macrolides (Tulathromycin and Tylosin), depending on causative agent and severity of disease.

- Marbofloxacin is a third-generation fluoroquinolone antimicrobial with broad-spectrum bactericidal activity against major bacteria. It exerts its antibacterial effect by inhibiting DNA gyrase and topoisomerase IV, enzymes essential for bacterial DNA replication and cell division, resulting in rapid bacterial death. Additionally, Marbofloxacin exhibits low MICs (minimum inhibitory concentrations) against respiratory pathogens, indicating high antibacterial potency.
- Marbofloxacin possesses favorable pharmacokinetic characteristics, including excellent tissue distribution and high penetration into respiratory tract, particularly pulmonary epithelial lining fluid and lung tissues, enabling effective drug concentrations at site of infection. Its concentration-dependent bactericidal activity and prolonged post-antibiotic effect facilitate rapid reduction of the bacterial burden and promote clinical recovery.
- Inj. Marbofloxacin **(Marbomet)** is administered @ 2.0 mg/kg b.wt. *via* IM/SC/IV route once daily for 3 - 5 consecutive days. For single-dose therapy, Inj. Marbofloxacin **(Marbomet LA)** @ 8-10 mg/kg b.wt. *via* IM/IV route is recommended for complete clinical recovery.
- Another important antimicrobial for treatment of pneumonia is Cefquinome sulphate, a fourth-generation cephalosporin developed exclusively for Veterinary use. Its unique quaternary ammonium group imparts a zwitterionic character, enhancing penetration through outer membrane of Gram-negative bacteria and improving stability against β-lactamases. Cefquinome sulphate exerts a bactericidal effect by inhibiting bacterial cell wall synthesis through binding to penicillin-binding proteins. It possesses a broad antimicrobial spectrum against both Gram-positive and Gram-negative bacteria.
- Cefquinome sulphate is approved for the treatment of respiratory tract infections (e.g., bovine respiratory disease [BRD] and pneumonia), septicemia, mastitis, endometritis and other soft tissue infections. The drug demonstrates excellent efficacy against major respiratory pathogens commonly associated with bovine pneumonia. Clinical studies have reported a therapeutic success rate of approximately 98% in acute bovine respiratory disease (BRD), highlighting its effectiveness in reducing respiratory signs and promoting rapid recovery in affected animals (Finaki *et al.*, 2001).
- For the treatment of bovine pneumonia, Inj. Cefquinome **(Bactivon)** or Cefquinome with Tazobactam **(Bactivon Tazo)** is administered @ 1 mg/kg b.wt. *via* IM/IV route once daily for 3-5 consecutive days, depending on disease severity and clinical response.

Pain Relief and Anti-inflammatory Therapy

- Non-steroidal anti-inflammatory drugs (NSAIDs) are commonly used to reduce fever, pain and inflammation associated with pneumonia, thereby improving animal comfort and recovery.
- Inj. Meloxicam **(Melonex)** is administered @ 30 ml/300 kg b.wt. *via* IM/IV/ SC route.

Antihistamine Therapy

Inj. Chlorpheniramine maleate **(Anistamin)** is administered @ 5-10 ml *via* IM route to reduce histamine mediated inflammation, respiratory irritation, nasal discharge and associated discomfort, thereby improving animal comfort and respiratory function.

Supportive Therapy

Supportive care, including adequate hydration, electrolyte therapy, nutritional support and multi-vitamin supplementation **(Inj. Tribivet and Bolus Tribivet)**, is essential to support recovery and improve overall health, particularly in severely affected animals.

Prevention and Control

- Vaccinate all susceptible animals against Hemorrhagic Septicemia (HS) annually, preferably before the onset of monsoon season, to enhance herd immunity and reduce risk of respiratory disease outbreaks and associated mortality.
- Minimize stress associated with weaning, transportation, handling, overcrowding and environmental changes, as stress can suppress immune function and increase susceptibility to pneumonia.

- Ensure adequate colostrum feeding in newborn calves to establish effective passive immunity and enhance immunity against respiratory infections.
- Maintain clean, dry and well-ventilated housing with appropriate stocking density to reduce pathogen exposure and improve air quality.
- Provide balanced ration and continuous access to clean water to improve overall health.
- Avoid performing stressful procedures such as dehorning and castration close to weaning period; these should preferably be completed several weeks before weaning.
- Isolate and promptly treat affected animals to reduce transmission and limit disease spread within the herd.

Clinical Study on Marbofloxacin and Cefquinome Sulphate

Comparing Clinical Efficacy of Marbofloxacin and Cefquinome Sulphate in Caprine Pneumonia (Nair *et al.*, 2023).

Objectives

The study was conducted to compare clinical efficacy of Marbofloxacin and Cefquinome sulphate in treatment of naturally occurring bacterial pneumonia in goats. Therapeutic response was assessed using clinical signs, cumulative clinical score and hematological parameters.

Materials and Methods

A total of 164 goats (2 months to 5 years of age) presented at Clinic, College of Veterinary Science and Animal Husbandry, Sardarkrushinagar, Dantiwada (SDAU) Gujarat, with a history of respiratory illness of approximately 5 days duration, were screened for inclusion in study. Based on the microbiological examination of nasal swab samples, pneumonia was confirmed in 70 goats, of which 50 animals were included in treatment groups. A modified cumulative clinical score (CCS) system was used to assess disease severity and monitor treatment response. Treatment efficacy was evaluated up to 5 days, with 10 clinically healthy goats serving as control (Table 4).

Table 4: Experimental Design

Group	No. of Animals	Treatment
T1	30	Marbofloxacin **(Marbomet)** @ 2 mg/kg b.wt., IM, once daily for 3 days
T2	20	Cefquinome Sulphate **(Bactivon)** @ 2 mg/kg b.wt., IM, once daily for 3 days
Control	10	No Treatment

Haematological parameters including haemoglobin (Hb), total erythrocyte count (TEC), total leukocyte count (TLC), differential leukocyte count (DLC), platelet count and packed cell volume (PCV) were measured using an automated haematology analyzer.

Results

Clinical improvement was observed from second day of treatment in both Marbofloxacin **(Marbomet)** and Cefquinome sulphate **(Bactivon)** groups, as evidenced by a reduction in cumulative clinical scores. All goats that completed the treatment protocol recovered completely and were clinically healthy by end of study. On 5th day post-treatment, haematological examination revealed a significant increase in haemoglobin (Hb) concentration in both groups and total erythrocyte count (TEC) in Marbofloxacin group, along with a significant decrease in platelet, total leukocyte, lymphocyte, eosinophil and basophil counts compared with their respective pre-treatment values in both groups.

Conclusion

The study demonstrated that both Marbofloxacin and Cefquinome sulphate are effective against pneumonia, as evidenced by improvements in cumulative clinical scores (CCS). Clinical improvement was observed during treatment period and favorable changes in haematological parameters further supported therapeutic recovery. These findings suggest that both Marbofloxacin **(Marbomet)** and Cefquinome sulphate **(Bactivon)** can be used successfully for treatment of pneumonia in dairy animals.

Conclusion

Bovine pneumonia is a multifactorial disease which results from interaction of infectious agents, including bacteria and viruses, with predisposing factors such as transportation stress, weaning, mixing (commingling) of animals, overcrowding, poor ventilation, climatic stress, inadequate colostrum intake and nutritional deficiencies. These factors impair host immunity and respiratory immune mechanisms, allowing pathogens to colonize and proliferate, resulting in toxin production and a severe inflammatory response that leads to lung consolidation, tissue damage, impaired gas exchange and respiratory distress. Clinically, affected animals exhibit pyrexia, depression, reduced feed intake, decreased milk production, coughing, nasal discharge, tachypnea, dyspnea and abnormal lung sounds; in severe cases, open-mouth breathing and death may occur. Early diagnosis and prompt treatment with appropriate antimicrobial therapy, anti-inflammatory drugs and supportive care are essential to limit pulmonary damage and improve recovery.

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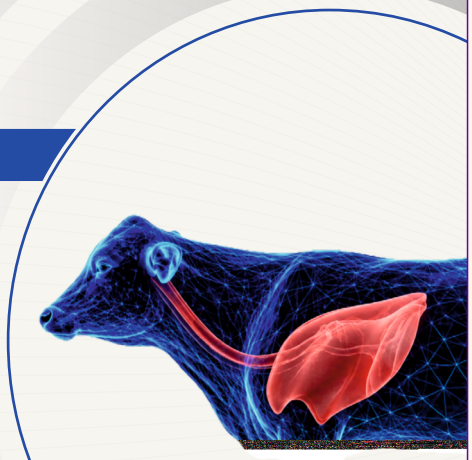
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