REVIEW ARTICLE

Common Respiratory Disorders and their Management in Equines: An Overview

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Abstract

Respiratory issues significantly impact horses, affecting performance and their overall health. Factors like weather, stress from racing, and exposure to irritants contribute to upper and lower respiratory tract problems. Nasal breathing and the lengthy nasopharynx of horses predispose them to airborne irritants. Diseases like nasal polyps, ethmoid hematomas, sinusitis, guttural pouch diseases, laryngeal issues, and pneumonia affect horses across ages and breeds, leading to symptoms such as nasal discharge, breathing difficulties, and exercise intolerance. Diagnosis often involves endoscopy, radiography, and cytology. Treatment varies from surgical interventions to environmental modifications, emphasizing early detection for effective management. This review focuses on understanding how the complexity of these respiratory disorders can enable targeted strategies to safeguard the health and performance of horses.

Key words: Diagnosis, Equine, Pneumonia, Respiratory diseases, Treatment.

Ind J Vet Sci and Biotech (2024): 10.48165/ijvsbt.20.5.01

Introduction

Respiratory issues are a major concern for horses, particularly those in equine sports. They are the second most common reason for training disruptions in Australian racehorses (Gilkerson *et al.*, 2015). These problems not only affect performance but also jeopardize the health of young and adult horses, sometimes leading to fatalities. Respiratory disorders in horses rank as the fourth most common health issue among equines, following colic, trypanosomiasis, and lameness (Singh *et al.,* 2010). Factors like weather, confined housing in winter, stress from racing and travel, and exposure to respiratory viruses contribute to these conditions. Dust, airborne irritants, bacteria, molds, and ammonia exposure are common culprits. Symptoms like nasal discharge, coughing, sneezing, and increased mucus production compromise the horse's natural defense mechanisms, mainly relying on nasal breathing (Gerard and Wilkins, 2015).

It's crucial to consider the horses' inherent defenses against infections when exploring the development of equine infectious respiratory diseases. Horses are unique in that they primarily breathe through their nasal passages, and they possess a lengthy nasopharynx. This arrangement prevents these particles from easily reaching the lower respiratory tract (Gilkerson *et al.*, 2015). These ailments reduce performance and cause exercise intolerance due to lung function impairment (Davidson *et al.*, 2011).

Respiratory diseases in equines may involve upper or lower respiratory tract. Disorders of the upper airways are primarily mechanical in nature while those of the lower airway are often associated with infection (Davidson and Martin, 2003). Lower respiratory tract diseases in horses are mainly caused by both infectious and non-infectious agents (Allen *et al.*, 2006; Ramzan *et al.*, 2008). Most infectious diseases are considered to be initiated by viral infections. Non-infectious respiratory diseases are commonly due to hypersensitivities to allergens in the stable environment, for example inflammatory airway disease (IAD) in younger horses and recurrent airway obstruction (RAO) in older horses. The most frequently identified bacteria associated with lower airway disease are *S. zooepidemicus, S. pneumoniae*, and *Actinobacillus equuli* (Burrel *et al.*, 1996). Numerous viral agents have been linked to respiratory disease in horses, although the evidence establishing causation for some of these agents is weak (Gilkerson *et al.*, 2015).

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How to cite this article: Narang, A., Preet, G. S., & Randhawa, S. S. (2024). Common Respiratory Disorders and their Management in Equines: An Overview. Ind J Vet Sci and Biotech. 20(5), 1-8.

Source of support: Nil

Conflict of interest: None

Submitted 09-01-2024 **Accepted** 12-07-2024 **Published** 10-09-2024

Common Respiratory Affections

Some of the common respiratory affections and disorders in horses are discussed below.

Nasal Polyps

Nasal polyps are relatively rare in horses, accounting for about 2.5% of all equine sinonasal diseases (Tremaine and Dixon, 2001). These pedunculated growths arise from the mucous membrane of the nasal cavity, nasal septum, or tooth roots. Typically, singular and unilateral, they can occasionally appear as multiple growths on both sides of the nasal passages (Rose and Hodgson, 2000). Polyps develop in response to chronic inflammation, resulting in mucous membrane thickening or excessive fibrous connective tissue proliferation. Clinical signs include compromised airflow through the affected nasal passage, difficulty in inspiration, malodorous mucopurulent nasal discharge, and occasional low-volume nosebleeds (Brar, 2017). In some cases, the polyp may protrude beyond the nostrils. Diagnosis involves endoscopy and radiography to visualize the growths, with definitive diagnosis through histopathological examination of biopsy samples. Surgical removal is typically performed through incisions in the false nostril, trephine openings, or the creation of a nasal bone flap (Crecan *et al.,* 2021).

Ethmoid Hematoma

Ethmoid hematoma in horses, though well-known, remains poorly understood. It typically presents as bloody nasal discharge due to a hematoma-like mass in the ethmoturbinates (Textor *et al.,* 2012). This progressive, non-cancerous condition affects the nasal passages and paranasal sinuses, with its exact cause unknown (Rose and Hodgson, 2000). Despite its tumor-like appearance, it is not a neoplasm. Larger hematomas usually originate within the ethmoid labyrinth, while smaller ones develop from the sinus floor and may extend into the nasal passages. Growth can cause pressure on surrounding bone, sometimes leading to necrosis, though facial distortion is rare. Ethmoid hematoma primarily affects horses over six years old.

The main clinical sign is mild, intermittent, and unilateral nosebleeds (epistaxis). Larger masses may reduce airflow in the affected nasal passage and cause unpleasant breath. In prolonged cases, the mass might protrude from the nostrils (Stich *et al.,* 2001). Diagnosis is based on medical history, clinical signs, upper airway endoscopy, and radiography, but confirmation requires histological evaluation. Additional imaging like CT and MRI can help assess the size of mass, location, and structural damage (Stich *et al.,* 2001). Conservative management includes intralesional injection of a 4% formaldehyde solution. For hematomas within a paranasal sinus, a trephine hole may be needed for direct formalin administration. Systemic NSAIDs are typically given before formalin injection to reduce inflammation.

Sinusitis

Sinusitis stands as the prevalent condition impacting the paranasal sinuses, categorized as primary or secondary and acute or chronic (Nickels, 2012). Primary sinusitis typically follows an upper respiratory tract infection, while secondary sinusitis can stem from dental issues, facial trauma, maxillary cysts, ethmoid hematomas, sinonasal neoplasia, or post-operative complications after tooth extraction surgery (Tremaine and Dixon, 2001). The last four upper cheek teeth have a higher propensity for developing tooth root abscesses, given their extension into the maxillary sinus (Rose and Hodgson, 2000). *Streptococcus equi* and *Streptococcus zooepidemicus* are commonly isolated bacteria in cases of primary sinusitis (Freeman, 2003), whereas secondary sinusitis cultures typically reveal a mix of bacteria, including anaerobes (O'Leary and Dixon, 2011). Clinical signs encompass unilateral mucopurulent nasal discharge and facial deformities. Tooth root abscesses often generate foul-smelling nasal discharge. Diagnosis involves skull radiography and a comprehensive oral examination, with computed tomography as an alternate imaging method.

Primary sinusitis treatment involves saline lavage in copious amounts, potentially supplemented with a broad-spectrum antibiotic or antiseptic. Systemic antibiotics tailored to culture and sensitivity findings are employed (Freeman, 2003).

Sinus Cysts

Sinus cysts are singular or clustered fluid-filled spaces lined with epithelium. They emerge in the maxillary sinuses and ventral conchae, occasionally extending into the frontal sinus. Key clinical indicators include facial deformity, nasal discharge, and partial airway blockage (Rose and Hodgson, 2000). Radiography offers more diagnostic clarity for sinus cysts compared to endoscopy. Treatment involves surgically removing the cyst and associated conchal lining radically. The prognosis for full recovery is favorable, with a low recurrence rate.

Guttural Pouch Diseases

The guttural pouches connect with the pharynx via epipharyngeal openings situated on the dorsolateral pharyngeal walls. Common guttural pouch conditions include guttural pouch empyema, guttural pouch mycosis, and guttural pouch tympany.

a) Guttural Pouch Empyema

Empyema in the guttural pouches can affect horses of all ages, with young horses being more susceptible. Retropharyngeal lymph node abscesses are frequent causes, sometimes leading to chondroid formation in chronic cases (Hardy and Léveillé, 2003). Typically associated with strangles, β-hemolytic *Streptococcus equi* is commonly found in these infections. Other isolates in horses with guttural pouch empyema include *Escherichia coli, Klebsiella* spp, *Corynebacterium* spp, *Bordetella* spp, *and Salmonella* spp.

Clinical signs comprise intermittent purulent nasal discharge, painful swelling in the parotid area, and in severe cases, stiff head carriage and stertorous breathing

(Hardy and Léveillé, 2003). Diagnosis involves endoscopic examination of the guttural pouch (Fig. 1), and radiographs of the pharynx can reveal fluid lines in the pouch and any associated retropharyngeal mass. Treatment requires systemic antimicrobial therapy and guttural pouch lavage.

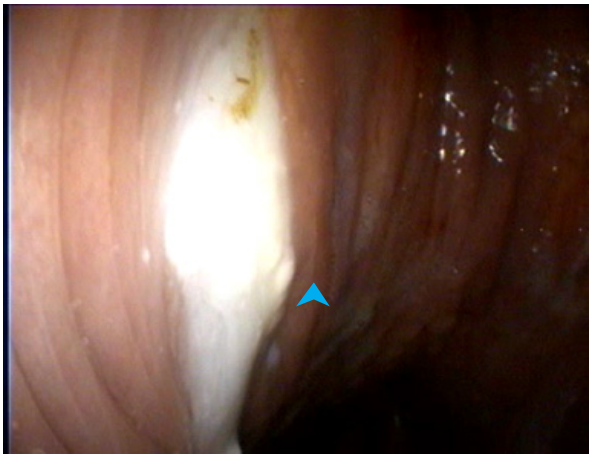

Fig. 1: Pharynx area revealed pus (arrow) from the medial cartilaginous flap of right guttural pouch

b) Guttural Pouch Mycosis

This condition affects horses of all ages without any breed or gender predisposition (Crotty *et al*., 2005). *Aspergillus* spp is the most common fungal organism associated with guttural pouch mycosis. Mycotic plaques are often found on the caudodorsal aspect of the medial guttural pouch, particularly over the internal carotid artery. Severe spontaneous haemorrhage, epistaxis, and dysphagia are common signs, with Horner syndrome and dorsal displacement of the soft palate. Diagnosis and treatment involve endoscopic examination, with treatment including topical and systemic antifungal therapy based on sensitivity testing.

c) Guttural Pouch Tympany

This developmental disorder is more prevalent in foals and can sometimes result from upper respiratory tract inflammation (Rose and Hodgson, 2000). It presents as a non-painful swelling in the parotid region due to distension of one guttural pouch with air. Severely affected animals may experience stertorous breathing. Diagnosis involves clinical signs and skull radiography. Management typically includes medical approaches with NSAIDs and antimicrobial therapy to address upper respiratory tract inflammation, and surgical intervention, such as fenestration of the membrane separating the affected and normal guttural pouch.

Recurrent Laryngeal Neuropathy (Laryngeal Hemiplegia)

Typically, it affects the left side of the larynx and is more prevalent among larger-breed horses (Cahill and Goulden, 1987). The condition involves a failure of the structurally normal arytenoid cartilage to abduct due to decreased or absent motility of its main abductor. Often termed idiopathic laryngeal hemiplegia, the cause remains unknown in most cases, although it could result from neuropathy due to various factors like mechanical compression or stretch of the left recurrent laryngeal nerve, bacterial or viral infections, vitamin deficiencies (Cahill and Goulden, 1987), perineural injections, neoplasia, or head, neck, and paralaryngeal trauma (Martin-Giménez *et al.,* 2019) or abscessation (Rose *et al*., 1981).

Key clinical signs include exercise intolerance and variable inspiratory noise resembling a roar or whistle (Dixon *et al.,* 2002). Presently, endoscopy at rest (Fig. 2) or during exercise is the preferred method for assessing laryngeal dysfunction in horses. Prosthetic laryngoplasty is a common treatment, though it can lead to immediate post-operative complications like dysphagia, wound infections, and sudden loss of arytenoid abduction (Froydenlund and Dixon, 2014).

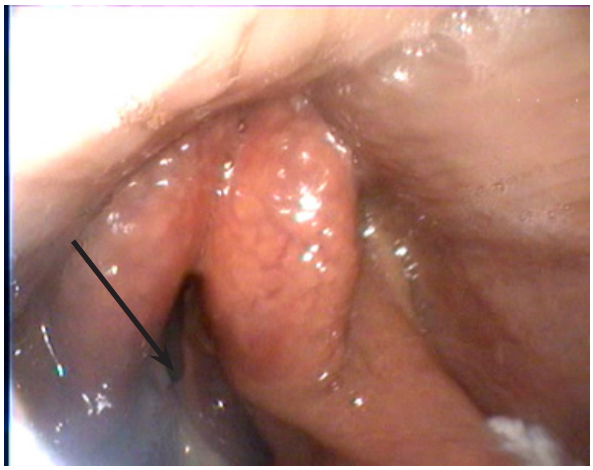

Fig. 2: Right laryngeal hemiplegia characterized by stasis of the right arytenoid cartilage due to which there is no complete abduction (arrow)

Dorsal Displacement of the Soft Palate

Dorsal displacement of the soft palate (DDSP) often causes upper respiratory noise during exercise and can be intermittent or persistent. In young Thoroughbred horses, intermittent displacement at rest is more common than in mature animals (Embertson, 1998). During DDSP, the caudal edge of the soft palate moves above the epiglottis, creating a functional airway obstruction, reducing the pharynx's cross-sectional area, and increasing airflow resistance and turbulence. Persistent DDSP causes gurgling or snoring noises at rest and during early exercise, along with signs of dysphagia and coughing (Kuwenyi, 2023).

Diagnosing intermittent DDSP, a common upper respiratory issue in performance horses, often relies on exercising examinations using a treadmill or overground endoscopy (Fig. 3), which is considered the gold standard. Treatment often involves rest and anti-inflammatory therapy. Soft palate resection is a common procedure, with about a 50% success rate in managing this condition.

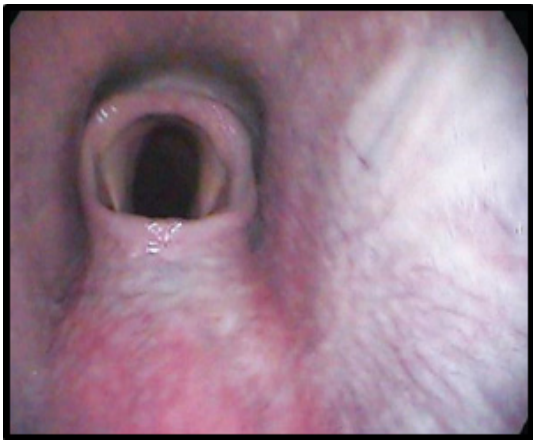

Fig. 3: Free border of Soft palate visible and caudal aspect of displaced Soft palate obscures visualization of epiglottis

Pharyngeal Lymphoid Hyperplasia

Pharyngeal lymphoid hyperplasia (PLH) is a condition in horses characterized by the proliferation of equine tonsillar structures. Its diagnosis has become more frequent due to increased awareness, advancements in diagnostic endoscopy, and a higher incidence in young horses aged 1-3 years. In young, developing horses, lymphoid follicles appear as raised nodules on the pharyngeal roof and extend along the lateral walls and cranially into the nasopharynx. In mature horses, these follicles merge with the mucosal tissue and become less noticeable (Auer *et al*., 1985). The causes of PLH are nonspecific and can involve viral and bacterial agents, air turbulence, and exposure to caustic substances. Virtually all young horses develop hyperplasia of pharyngeal lymphoid follicles (Brar *et al*., 2019). In young animals, in addition to pharyngitis, other irritants may contribute to PLH (Neumeister and Reinertson, 1982). Racing performance is unlikely to be affected by PLH, although in severe cases (grades III-IV), a decrease in performance and chronic cough may be noticeable (Rose and Hodgson, 2000).

Signs of pharyngeal pain include reduced appetite, chronic coughing, and frequent swallowing. Treatment is generally unnecessary in most cases, although rest and administration of NSAIDs can be beneficial for horses displaying pharyngeal pain.

Strangles (Distemper)

Strangles is among the most common upper respiratory bacterial infections in equines (Waller and Jolley, 2007). It's an infectious, contagious disease primarily affecting young foals (Slater, 2007). The causative organism, *Streptococcus equi equi,* is an obligate parasite and primary pathogen, causing high morbidity and low mortality in susceptible populations. The incubation period can extend up to 2 weeks, and within 24 h, symptoms include fever, bilateral nasal discharge, subsequent lymph node enlargement, and abscesses. Dysphagia and abnormal respiratory noises occur due to pressure on the pharynx from the formed abscess (Corinne, 2010).

Diagnosis involves a combination of history, clinical signs, and bacteriological culture obtained from affected lymph nodes. Administering penicillin in the early stages (≤24 h from the onset of fever) usually halts abscess formation. Antibiotic therapy after abscess formation may temporarily improve fever and depression but ultimately prolongs the disease by delaying abscess maturation. Drainage of mature abscesses is crucial for prompt recovery. Ruptured abscesses should be flushed with a diluted (3-5%) povidone-iodine solution until discharge ceases. NSAIDs can be used cautiously to reduce pain and fever and improve appetite in horses with severe clinical disease. Tracheotomy may be necessary for horses with retropharyngeal abscesses and pharyngeal compression. Untreated guttural pouch infections can lead to persistent guttural pouch empyema with or without chondroid formation.

Pneumonia

Equine pneumonia is a prevalent respiratory ailment that can pose a serious threat, particularly to young horses. Factors such as viral respiratory infections, general anesthesia, extended transportation, and intense exercise commonly contribute to compromised pulmonary defense mechanisms, increasing the risk of secondary bacterial pneumonia (Narang and Randhawa, 2023).

a) Interstitial pneumonia

Interstitial pneumonia in horses, affecting all age groups, involves severe respiratory disease and often has a poor prognosis (Wilkins and Lascola, 2015). Buergelt *et al.* (1986) categorized its causes into infectious, toxic/chemical, and allergic origins. Similar to human interstitial lung disease, immune-mediated responses to various antigens - bacteria, viruses, fungi, parasites, smoke, silicosis, plant toxins, and adverse drug reactions - are implicated (Darshan *et al.,* 2020a). Radiographic confirmation includes a nodular interstitial pattern in the caudal lung lobe, and moderate neutrophilia with degenerative changes in a transtracheal wash serves as a diagnostic marker. Chronic inflammation in interstitial lung disease may be sustained by chronic infection of alveolar and/or bronchiolar cells (Bolfa *et al.,* 2013). The presence of Langhans giant cells in BAL fluid, though rare, may indicate chronic interstitial pneumonia (Wilkins, 2003). Contributing factors include stress, viral infections, malnutrition, exposure to dust or harmful gases, immunosuppressive therapy, immunodeficiency disorders, and general anesthesia (Reuss and Giguere, 2015).

b) Bacterial pneumonia

Bacterial pneumonia frequently occurs in adult horses due to the aspiration of microorganisms normally inhabiting their nasopharynx or oral cavity. β-hemolytic streptococci are commonly isolated bacterial pathogens from adult

horses with pneumonia. While *Streptococcus equi* subsp. *zooepidemicus* is typically an opportunistic pathogen in horses, in certain circumstances, it can cause mild to severe, primarily suppurative, bronchopneumonia and pleuropneumonia (Fulde and Valentin-Weigand, 2013). Other bacterial pathogens, including *Klebsiella* spp, *Staphylococcus* spp., and *Escherichia coli*, are also isolated (Giguere *et al.*, 2010). Clinical manifestations often include dyspnea, hemoptysis, fever, nasal discharge (Fig. 4) and chronic cough. The lungs exhibit diffuse pulmonary consolidation, predominantly affecting cranioventral areas. A marked neutrophilia with degenerative changes in transtracheal wash, along with evident pneumonic changes on ultrasonography, provides a better indication of bacterial pneumonia. The prognosis for survival and return to athletic function depends on early diagnosis and appropriate therapeutic measures (Reuss and Giguere, 2015).

Fig. 4: Mucopurulent discharge in a horse suffering from bronchopneumonia

c) Pleuropneumonia

Pleuropneumonia in horses often develops secondary to bacterial pneumonia or thoracic wounds. Predisposing factors include viral respiratory infections, long-distance transportation, general anesthesia, and strenuous exercise, which weaken pulmonary defenses and allow bacterial invasion. Polymicrobial infections, often involving mixed anaerobic-aerobic bacteria, are common, with multiple organisms isolated from transtracheal aspirates. Symptoms include fever, depression, decreased appetite, weight loss, leukocytosis with neutrophilia, and increased immunoglobulins (Couetil *et al.,* 2016; Singh *et al.,* 2019). Specific signs of pleural pain are short strides, guarding, flinching upon chest percussion, shallow respiration, and signs of endotoxemia. Laboratory findings suggest bacterial sepsis or toxemia. Diagnosis confirmed by thoracic ultrasonography, and thoracocentesis is used for both diagnosis and treatment. Treatment includes broad-spectrum antibiotics, NSAIDs, and supportive care. Intrathoracic fibrinolytic therapy can help reduce fibrin deposition and pleural fluid accumulation.

d) *Rhodococcus equi Pneumonia*

Rhodococcus equi significantly impacts foals aged 1-6 months, with symptoms often appearing before 4 months (Sharma *et al.,* 2017). It causes economic losses due to high mortality, prolonged treatment, and costly preventive measures. Morbidity rates can reach 80% in newborns (Ozsoy and Haziroglu, 2009). Infection primarily occurs through inhalation of contaminated dust. The disease typically presents as chronic suppurative bronchopneumonia with extensive abscessation and suppurative lymphadenitis (Zink *et al.,* 1986). Early signs include lethargy, fever, and tachypnea, with diarrhea occurring in about one-third of cases due to colonic micro-abscessation (Darshan *et al.,* 2020b). Common laboratory findings are neutrophilic leukocytosis and hyperfibrinogenemia. Thoracic radiography often shows perihilar alveolization, consolidation, and abscessation, with nodular lung lesions (Fig. 5) and mediastinal lymphadenopathy in foals aged 1-4 months indicating *R. equi*. Diagnosis involves transtracheal wash cytology and culture (Leclere *et al.,* 2011). Treatment typically consists of erythromycin and rifampin for 3-8 weeks (Reuss and Cohen, 2015; Sharma *et al.,* 2017). Supportive care includes maintaining a clean environment, providing dust-free feeds, IV fluid therapy, and saline nebulization to aid in clearing pulmonary exudates.

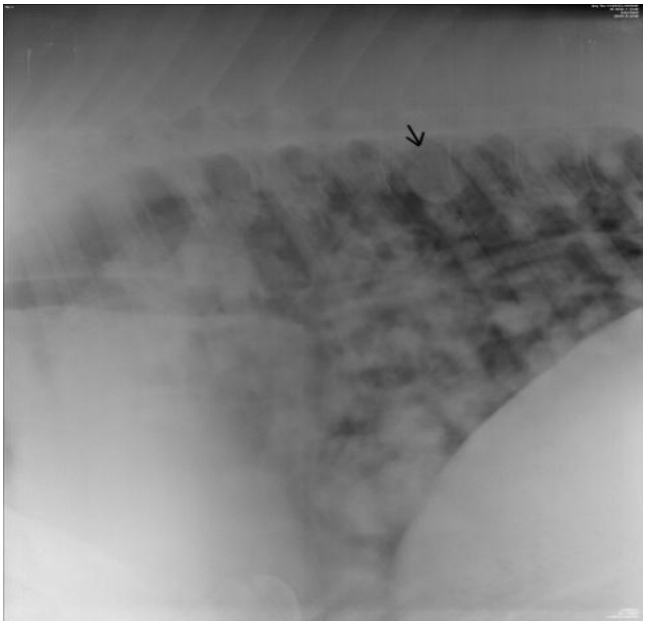

Fig. 5: Cotton wool abscesses (nodular interstitial pattern) in lung in foal suffering from *R. equi* infection

Exercise-Induced Pulmonary Haemorrhage

Exercise-induced pulmonary haemorrhage (EIPH) is frequently observed in racehorses that undergo intense exercise for short durations (Hinchcliff *et al.*, 2015). After exercise, these horses often exhibit respiratory distress and increased swallowing rates. Epistaxis, or nosebleeds, occur in a small percentage (1-10%) of horses affected by EIPH. Diagnosis typically involves detecting blood during tracheoscopy or identifying hemosiderin in alveolar macrophages (Doucet and Viel, 2002). Haemorrhage commonly occurs in the caudo-dorsal lung areas and is associated with macrophagic bronchiolitis and fibrosis (Derksen *et al.*, 2009). Endoscopic identification of blood in the airways 30-90 min post-exercise is definitive evidence of EIPH. Thoracic radiography may reveal alveolar or mixed alveolar-interstitial opacities in the caudodorsal lung fields; however, its impact on diagnosing EIPH is limited. Furosemide has shown efficacy in reducing both the incidence and severity of EIPH in Thoroughbred racehorses. Nasal dilator bands application reduces red blood cell counts in BAL fluid by 33% in affected horses.

Inflammatory Airway Disease (IAD)

Inflammatory airway disease (IAD) refers to a diverse group of inflammatory lower respiratory tract conditions that primarily appear noninfectious. Horses of all ages and breeds, including racehorses and non-racehorses, can be affected by IAD (Cardwell *et al.,* 2011). Suspected causes of IAD include allergic airway disease, repeated pulmonary stress, exposure to dust particles, environmental pollutants, and/or persistent respiratory viral infections, particularly EHV-2. The most common clinical signs include a chronic cough and mucoid to mucopurulent nasal discharge. Endoscopic examination often reveals mucopurulent exudate in the pharynx, trachea, and bronchi. Diagnosis of IAD involves assessing poor race performance and clinical symptoms. Bronchoalveolar lavage (BAL lavage) helps characterize the pulmonary inflammation type. Cytologic evaluation of BAL fluid typically reveals mixed inflammation with elevated total nucleated cells, mild neutrophilia, lymphocytosis, monocytosis, or increased metachromatic cells. In some cases, eosinophilic inflammation may be present (Couetil *et al.*, 2016). Aerosolized bronchodilator therapy administered before exercise to prevent exercise- or irritant-induced bronchoconstriction can benefit affected horses. Systemic corticosteroid therapy is advised to diminish pulmonary inflammation in horses with eosinophilic IAD (Couetil *et al.*, 2016). Aerosol administration of inhaled corticosteroids such as beclomethasone or fluticasone can improve clinical respiratory signs.

Chronic Obstructive Pulmonary Disease (COPD) or Heaves

Chronic Obstructive Pulmonary Disease (COPD) affects about 12% of mature horses, regardless of gender or breed (Cardwell *et al.,* 2011). It is triggered by common allergens often associated with stable confinement, straw bedding, and hay. Molds and endotoxins in bedding and feed may contribute to its development (Rose and Hodgson, 2000). COPD involves small-airway neutrophilic inflammation, increased mucus production, and bronchoconstriction upon allergen exposure. Symptoms include flared nostrils, tachypnea, coughing, and a visible "heave line" along the abdomen (Fig. 6). Diagnosis is based on historical evidence and physical examination, with radiographic findings showing peribronchial infiltration and over-expanded pulmonary fields. BAL cytology indicates non-septic inflammation with increased non-degenerative neutrophils (Darshan, 2019). Environmental management, such as pasture turnout, avoiding straw bedding, and feeding pelleted feed, is the primary treatment strategy. Soaking hay may help mildly affected horses, but is impractical for highly sensitive ones. Medical treatment often includes bronchodilators and corticosteroids (Bertin *et al.,* 2011).

Fig. 6: Chronic obstructive pulmonary disease showing Heave Lines (Red arrows)

Conclusion

Respiratory problems in horses cover a broad array of upper and lower airway issues, from nasal polyps and sinusitis to pneumonia and chronic obstructive pulmonary disease. These conditions, often influenced by environmental factors, infections, and allergens, pose significant threats to a horse's health and athletic performance. Detecting these ailments early through thorough diagnostic methods like endoscopy, radiography, and cytology is essential for effective treatment and management. Tailored therapies, ranging from surgical interventions for nasal polyps to environmental modifications for COPD, play a pivotal role in alleviating symptoms and ensuring the horse's long-term well-being. By understanding the complexity and diversity

of these respiratory disorders, veterinarians and caretakers can implement targeted strategies to mitigate their impact and support the horse's respiratory health throughout its life.

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