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Pneumonia in Adult Horses

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Take Home Message

Bacterial infections of the lower respiratory tract are common in adult horses. Early diagnosis and appropriate treatment are essential for a favorable outcome and return to prior performance. This paper reviews the approach to successful management of adult horses with bacterial pneumonia.

Introduction

Bacterial infections of the lower respiratory tract are common in adult horses. Lower respiratory tract infections may be localized to the lumen of the airways (termed bacterial bronchitis or septic inflammatory airway disease) or may involve the pulmonary parenchyma (termed pneumonia). In equine medicine, the term bronchopneumonia is often used to refer to lower respiratory tract infection regardless of whether the infection is localized to the bronchi or the infection involves both the bronchi and the lung parenchyma. When there is subsequent extension of the infection from the pulmonary parenchyma to the visceral pleura and pleural space, the disease is referred to as pleuropneumonia. The spectrum of clinical signs shown by horses with bronchopneumonia is broad and reflects the severity of the disease process. Early identification of affected animals and immediate initiation of appropriate therapy are essential to prevent mortality and functional impairment of the respiratory system. Expenses incurred by owners of affected horses include cost of medical care, loss of income during the illness and the recovery period, cost of training after a prolonged period of inactivity, and financial loss due to death of some animals or diminished performance of others following recovery.

Infectious Agents Involved

Adult horses most commonly acquire bacterial pneumonia by aspiration of microorganisms that normally inhabit their nasopharynx or oral cavity. β-hemolytic streptococci, particularly Streptococcus equi subspecies zooepidemicus, are by far the most common bacterial pathogens isolated from adult horses with bronchopneumonia.1 Non-enteric Gram-negative bacteria such as Pasteurella spp. and Actinobacillus spp. are also frequently isolated, either alone or in combination with S. zooepidemicus. Enteric Gram-negative bacteria such as Klebsiella spp., Escherichia coli, Enterobacter spp., and Salmonella enterica may also be isolated. Other aerobic Gram-positives such as Staphylococcus spp. and Rhodococcus equi or Gram-negatives such as Pseudomonas spp. and Bordetella bronchiseptica are occasionally isolated.

Anaerobic bacteria are isolated from approximately one third of adult horses with severe bronchopneumonia, pleuropneumonia or pulmonary abscessation. The most common anaerobes
isolated are Bacteroides ssp., particularly B. fragilis, Clostridium ssp., and Peptostreptococcus ssp.; Fusobacterium ssp., and Eubacterium ssp. may also be isolated. Isolation of anaerobes from horses with pneumonia or pleuropneumonia has been associated with a less favorable prognosis in some studies. Mixed bacterial infections are very common and may represent synergy between aerobic or facultative aerobic and anaerobic bacteria.

Epidemiology

Bacterial bronchopneumonia may affect horses of any age and breed. In one retrospective study of 327 horses with pneumonia or pleuropneumonia, there was no sex predilection but 82% of the horses were less than 5 years of age. In a retrospective case-control study of risk factors for development of pleuropneumonia Thoroughbreds were at greater risk while Standardbreds were at lower risk of developing the disease. In the same study, the most significant risk factor for development of pleuropneumonia was long distance transport within the week prior to the onset of clinical signs. Other factors significantly associated with increased risk of developing pleuropneumonia include recent viral respiratory tract infection or exposure to horses with viral infections and racing within 48 hours prior to developing clinical signs.

Pathophysiology

Colonization of the lungs by opportunistic bacteria occurs when the pulmonary defense mechanisms are compromised or are overwhelmed by massive numbers of bacteria. Several factors can contribute to causing increased numbers of bacteria in the lower airways. Dysphagia or esophageal obstruction will lead to aspiration of large numbers of pharyngeal bacteria and these disease processes often result in pneumonia. However, the vast majority of horses with bacterial pneumonia or pleuropneumonia do not have a history of dysphagia or esophageal obstruction. Other factors that have been shown to significantly increase bacterial contamination of the lower respiratory tract include confinement with the head elevated, transportation, and high intensity exercise.

Pulmonary defense mechanisms can be compromised by numerous factors. These include stress (e.g. transport and intense exercise), viral infections, malnutrition, exposure to dust or noxious gases, immunosuppressive therapy, immunodeficiency disorders, and general anesthesia. Regardless of the exact mechanism predisposing to bacterial colonization, the inflammatory response induced by bacterial invasion results in infiltration with neutrophils and other inflammatory cells into the airways and pulmonary parenchyma. Inflammatory cells and their mediators cause damage to the airway epithelium and capillary endothelium, leading to flooding of the terminal airways with inflammatory cells, serum cellular debris, and fibrin. This process is generally more severe in the ventral portions of the lung.

Clinical Signs and Physical Examination

The spectrum of clinical signs shown by horses with bacterial lung infection is broad and usually reflects the severity of the disease process. Horses with septic inflammatory airway disease and no or minimal involvement of the lung parenchyma may be completely normal at rest. Clinical signs may be limited to exercise intolerance, poor performance, or affected horses may cough or
have bilateral nasal discharge during or immediately following exercise. Even in early cases of bronchopneumonia, clinical signs may not be obvious. As the disease progresses clinical signs may include any combination of fever, anorexia, depression, bilateral nasal discharge, cough, weight loss, tachypnea, and respiratory distress. Nasal discharge is usually mucopurulent but may be hemorrhagic in some cases with pulmonary infarction and necrotizing pneumonia. Halitosis and a foul smelling nasal discharge may be present and has been associated with infection by anaerobic bacteria. However, the absence of a putrid odor does not rule out anaerobic infections. Because the parietal pleura is highly innervated and painful when inflamed, horses with acute pleuropneumonia often exhibit pleurodynia (pleural pain).

Careful auscultation after application of a rebreathing bag (if not precluded by respiratory distress) is extremely valuable in defining the presence and sometimes extent of lung involvement. Horses with a large amount of secretions in the trachea often have an audible tracheal rattle. Most horses with bronchopneumonia cough when the rebreathing bag is applied whereas normal horses do not. Occasional inspiratory or expiratory crackles and/or wheezes may be heard over affected areas, which are more commonly located ventrally. Because consolidated lung parenchyma is a good acoustic medium, mild consolidation sometimes results in only increased bronchial sounds. In contrast, the lung sounds may be diminished in areas of severe consolidation, extensive abscess formation, or pleural effusion. Auscultation of horses with pleuropneumonia often reveals normal lung sounds in the dorsal lung fields with no sound or considerably decreased lung sounds ventrally. Pleural friction rubs are often not heard because they are present only in the acute stage of the disease. If they are heard, friction rubs are present predominantly at the end of inspiration and the early part of expiration. They disappear as inflammation decreases or as pleural fluids accumulate. Thoracic percussion is useful to detect and delineate pleural effusion with resonant sounds dorsal and dull sounds ventral to the horizontal line of effusion.

**Differential Diagnosis**

When physical examination and auscultation indicate pulmonary disease, the major clinical task is differentiating infectious from noninfectious causes. Among infectious causes, bacterial pneumonia is most common. Most viral infections are usually confined to the upper respiratory tract. However, multinodular pulmonary fibrosis, associated with EHV-5, will affect the lungs. Pulmonary aspergillosis most often follows severe gastrointestinal (GI) disease that had resulted in mucosal compromise. Severe respiratory disease unresponsive to antimicrobial therapy should arouse suspicion of fungal pneumonia. Parasitic pneumonitis is rare in adult horses but may be seen in horses pastured with donkeys or mules. The two major noninfectious causes of pulmonary disease that may be confused with bacterial pneumonia include heaves and non-septic inflammatory airway disease. Other uncommon causes of noninfectious pulmonary disease that may result in similar clinical signs include pneumothorax, pulmonary edema, smoke inhalation, and neoplasia. The diagnostic tests described below aid in the differentiation between infectious and noninfectious causes of lower respiratory tract disease.

When pleural effusion is present, several differentials should be considered. Bacterial pleuropneumonia is by far the most common cause of pleural effusion in horses. In one study, 90 of 122 horses (73.8%) with pleural effusion had pleuritis secondary to bacterial pneumonia or
lung abscessation. Other less common causes of pleural effusion in horses include hemothorax, penetrating chest wounds, esophageal ulceration or rupture, neoplasia, fungal pneumonia, pericarditis, congestive heart failure, diaphragmatic hernia, hypoproteinemia, and chylothorax.

**Diagnostic Approach**

Presumptive diagnosis of lower respiratory tract infection is generally based on clinical signs and careful auscultation of the lungs with a rebreathing bag. The need for additional diagnostic procedures is determined by the severity and duration of clinical signs, the number of affected animals, the value of the affected animal(s), as well as prior treatment used and response to such therapy. Bacterial pneumonia/pleuroneumonia most commonly affects only an individual horse on a given farm. In horses suspected of having bacterial pneumonia, the goal of diagnostic evaluation is to rule out diseases of the upper respiratory tract, and to determine the etiology and severity of lung involvement.

**Hematology and Biochemistry**

Horses with bacterial bronchopneumonia commonly have an inflammatory hematological profile. Leukocytosis and absolute neutrophilia with or without a left shift are supportive of bacterial infection. Neutropenia with a toxic left shift may also be evident in the acute stages in severely affected animals. Increased fibrinogen concentrations, hyperglobulinemia, and mild hypoalbuminemia are common.

**Tracheobronchial Aspirate for Cytology and Culture**

A tracheobronchial aspirate (TBA) for cytologic examination and bacterial culture is one of the most helpful diagnostic procedures available when bronchopneumonia is suspected. Airway fluid specimens should be submitted for cytology, Gram-stain, as well as aerobic and anaerobic bacterial culture. In horses with pleural effusion, a tracheobronchial aspirate should be obtained even if pleural fluid is available for bacterial culture. In one study, culture of the pleural fluid was negative in 43% of 111 horses with pleuroneumonia whereas tracheobronchial fluid yielded growth in all cases. Only approximately 5% of cases had growth from the pleural fluid but not from the tracheobronchial aspirate.

**Thoracic Ultrasonography**

Thoracic ultrasonography can be performed using a range of transducers and machine types. The normal aerated lung parenchyma is not penetrated by the ultrasound beam, rendering only the pleural space and superficial lung surface available for study. Ultrasonography is a helpful diagnostic tool when lung involvement includes peripheral areas but may not be as useful as radiography to evaluate the full extent of lung lesions since lesions with overlying aerated lung will not be detected. However, in most horses with bronchopneumonia the periphery of the lung is affected, enabling the clinician to successfully image some of the lesions. Early ultrasonographic lesions are non-specific and may only include irregularities of the pleural surface. These lesions may progress to form focal areas of consolidation of various sizes.
Consolidated lung varies in appearance from dimples of the pleural surface to large wedge-shaped areas of sonolucent lungs.

Ultrasonography offers a considerable advantage over radiographs in the study of the pleural surfaces and space. Small amount of pleural effusion that would otherwise be missed clinically or by radiography can be easily detected by ultrasonography. Ultrasonography can also be used to assess the nature and approximate volume of fluid, select the optimal site and depth for thoracocentesis, and detect sequelae such as fibrin deposition, pleural adhesion, abscess formation, and pneumothorax.

Radiography

In horses with mild septic inflammatory airway disease thoracic radiographs may be normal or only reveal mild bronchial or bronchointerstitial patterns. In more severely affected animals, radiographs demonstrate irregular opacities in the ventral thorax that may obscure the normal vasculature and cardiac silhouette. Air bronchograms are sometimes visible. Abscesses are often present as circular soft tissue opacities of varying sizes. In some cases they may be cavitated with thick walls and a distinct horizontal line representing fluid gas interface. Pleural effusion appears as a horizontal line demarcating a ventral soft tissue opacity that obscures the heart and ventral lung fields. When severe pleural effusion is present, it is most efficient to perform thoracic radiographs after the pleural fluid has been drained. Although ultrasonography is superior to radiographs in horses with pleuropneumonia, radiography should still be performed when possible to detect and monitor resolution of deep pulmonary abscesses that may be missed during ultrasonography.

Thoracocentesis for Cytology and Culture

Thoracocentesis should be considered in horses with pleural effusion. The procedure can be of diagnostic value by allowing differentiation between septic pleuritis from effusion caused by other disease processes. It can also be of therapeutic value via removal of excessive chest fluid, which allows pulmonary re-expansion and a reduction in respiratory distress. Thoracocentesis is best performed using ultrasound guidance to determine the most appropriate site. A blunt teat cannula is typically used if a small volume of effusion is being sampled strictly for diagnostic purposes. Depending on the volume of effusion, a 16, 24, or 32 French chest tube is used when pleural drainage is also indicated (see below). An aliquot of pleural fluid is placed into tubes containing anticoagulant solution (EDTA) so that cytologic evaluation may be performed. Part of the fluid should be saved in sterile containers with appropriate transport media for subsequent Gram stain and aerobic as well as anaerobic bacterial culture.

Treatment

Systemic Antimicrobial Therapy

Administration of appropriate antimicrobial agents is the most important part of the therapeutic plan. The choice of the antimicrobial agent depends on the severity of the clinical signs, cost, ease of administration and, when available, results of bacteriologic culture and susceptibility
testing of a tracheobronchial aspirate. In early cases of mild bronchopneumonia, the practitioner is justified in suspecting *S. zooepidemicus* as the causative organism and treating accordingly. *S. zooepidemicus* is almost invariably susceptible to penicillin, ampicillin, and cephalosporins such as ceftiofur. The possibility of a mixed infection, especially involving Gram-negative organisms, must be kept in mind when such empiric therapy is unsuccessful. Ceftiofur offers the advantage of having a good spectrum of activity against common non-enteric and many enteric Gram-negative pathogens. Therapy of horses with mild lower respiratory tract infections should be continued for a minimum of 10 days or until clinical signs resolve. In some cases, the duration needed may preclude continuous intramuscular therapy because of muscle soreness. Trimethoprim-sulfonamide combinations (TMS) offer the advantage of oral administration. Unfortunately, the usefulness of TMS combinations for the treatment of bacterial respiratory tract infections in horses is limited by its lack of in vivo activity against *S. zooepidemicus*. In contrast to penicillin, TMS is ineffective in eradicating *S. equi* subspecies *zooepidemicus* in a tissue chamber model of infection in horses. This failure of in vivo response was observed despite in vitro susceptibility of the isolate and high concentrations of TMS in the tissue chamber fluid. Other oral antimicrobial agents may be considered depending on in vitro culture and susceptibility results (Table 1).

In more severe cases of bronchopneumonia and in all cases of pleuropneumonia, antimicrobial therapy should ultimately be selected based on results of culture and in vitro susceptibility testing. Polymicrobial and mixed aerobic/anaerobic infections are common; thus broad spectrum antimicrobial therapy is initially required. A combination of gentamicin for Gram-negative coverage and penicillin for Gram-positive and anaerobic coverage is commonly used as initial broad spectrum therapy for moderate to severe bronchopneumonia. Enrofloxacin can be used as a substitute to gentamicin for Gram-negative coverage in adult horses especially when azotemia is present. Advantages of enrofloxacin over gentamicin include greater activity against Enterobacteraceae, better penetration in phagocytic cells and tissues, and better activity in purulent material. However, enrofloxacin should never be used as stand-alone initial therapy in horses with bronchopneumonia because of its lack of activity against anaerobes and against streptococci such as *S. zooepidemicus*. Ceftiofur can replace penicillin for Gram-positive coverage and offers the supplementary advantage of providing additional Gram-negative coverage.

Treatment of anaerobic pleuropneumonia is usually empiric, because antimicrobial susceptibility testing of anaerobes is difficult because of their fastidious nutritive and atmospheric requirements. Thus familiarity with antimicrobial susceptibility patterns is helpful in formulating the treatment regimen when an anaerobe is suspected. The majority of anaerobic isolates are susceptible to relatively low concentrations of penicillin. However, *Bacteroides fragilis*, a frequently encountered anaerobe in horses with pleuropneumonia, is routinely resistant to penicillin. Other members of the *Bacteroides* family are known to produce β-lactamases and are potentially penicillin resistant. Metronidazole has excellent in vitro activity against a variety of obligate anaerobes including *B. fragilis*. Oral administration rapidly results in adequate serum levels and thus is an acceptable route of administration for horses with pleuropneumonia. Therefore, if anaerobic infection is suspected, oral metronidazole is usually added to the combinations mentioned above.
Table 1. Antimicrobial agents commonly used to treat bacterial bronchopneumonia in adult horses.

<table>
<thead>
<tr>
<th>Antimicrobial a</th>
<th>Dose</th>
<th>Frequency (h)</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>β-lactams</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benzyl penicillins:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penicillin G (Na, K)</td>
<td>25,000 IU/kg</td>
<td>6</td>
<td>IV</td>
</tr>
<tr>
<td>Penicillin G (procaine)</td>
<td>25,000 IU/kg</td>
<td>12</td>
<td>IM</td>
</tr>
<tr>
<td>Aminobenzyl penicillins:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ampicillin sodium</td>
<td>20 mg/kg</td>
<td>8</td>
<td>IV</td>
</tr>
<tr>
<td>Ampicillin trihydrate</td>
<td>20 mg/kg</td>
<td>12-24</td>
<td>IM</td>
</tr>
<tr>
<td>Cephalosporins:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cefazolin</td>
<td>10-20 mg/kg</td>
<td>6</td>
<td>IV</td>
</tr>
<tr>
<td>Ceftiofur sodium</td>
<td>2.2-4.4 mg/kg</td>
<td>24</td>
<td>IM</td>
</tr>
<tr>
<td>Ceftiofur crystalline free acid</td>
<td>6.6 mg/kg</td>
<td>see note b</td>
<td>IM</td>
</tr>
<tr>
<td><strong>Aminoglycosides</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amikacin</td>
<td>10 mg/kg</td>
<td>24</td>
<td>IV or IM</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>6.6 mg/kg</td>
<td>24</td>
<td>IV or IM</td>
</tr>
<tr>
<td><strong>Fluoroquinolones</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ciprofloxacin c</td>
<td>5.5 mg/kg</td>
<td>24</td>
<td>IV</td>
</tr>
<tr>
<td>Enrofloxacin c</td>
<td>5.5 mg/kg</td>
<td>24</td>
<td>IV</td>
</tr>
<tr>
<td>7.5 mg/kg</td>
<td>24</td>
<td></td>
<td>PO</td>
</tr>
<tr>
<td><strong>Tetracyclines</strong></td>
<td></td>
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<tr>
<td>Oxytetracycline d</td>
<td>6.6 mg/kg</td>
<td>12</td>
<td>IV c</td>
</tr>
<tr>
<td>Doxycycline e</td>
<td>10 mg/kg</td>
<td>12</td>
<td>PO d</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>50 mg/kg</td>
<td>6</td>
<td>PO</td>
</tr>
<tr>
<td>Metronidazole</td>
<td>25 mg/kg</td>
<td>12</td>
<td>PO</td>
</tr>
<tr>
<td>35 mg/kg</td>
<td>12</td>
<td>Per rectum</td>
<td></td>
</tr>
<tr>
<td>Rifampin</td>
<td>5 mg/kg</td>
<td>12</td>
<td>PO</td>
</tr>
<tr>
<td>Trimethoprim-sulfonamide</td>
<td>30 mg/kg (combined)</td>
<td>12</td>
<td>PO</td>
</tr>
</tbody>
</table>

a Pharmacokinetics data are available for horses but in most cases safety studies have not been performed in the equine species
b2 intramuscular injections 4 days apart. This regimen is designed to provide 10 days of coverage from the beginning of treatment

In cases of severe bronchopneumonia, lung abscesses or pleuropneumonia long-term antimicrobial therapy ranging from 3 weeks to sometimes several months may be required. In the initial stages of therapy intravenous antimicrobials are preferred to achieve higher serum concentrations. Oral antimicrobials can be used later in the course of the disease if appropriate.
based on susceptibility testing. Clinical signs, lung auscultation, fibrinogen concentrations and repeated ultrasonographic/radiographic examination are useful in assessing response to therapy and deciding when to discontinue antimicrobial therapy. Stall rest must be enforced during therapy of pneumonia, and return to exercise should be gradual and permitted only after the horse is clinically normal and antibiotic therapy has been completed.

**Aerosolized Antimicrobial Agents**

Aerosol administration of antimicrobial agents can result in high drug concentrations in the respiratory tract while minimizing systemic concentrations and their resulting toxicity. As a result, aerosolized antimicrobial agents may be a useful adjunct to oral or systemic administration particularly in horses with chronic septic inflammatory airway disease and no or minimal involvement of the lung parenchyma. Antimicrobial delivery by inhalation is greatly influenced by the product formulation and type of nebulizer. Aerosol use of intravenous formulations can lead to exposure to potentially irritant or toxic additives and inappropriate pH or osmolality ranges. In one study, the particle size distribution and particle density of gentamicin sulfate and ceftiofur sodium aerosols were affected by the antimicrobial concentration of the solution.\(^\text{16}\) Gentamicin concentrations of 50 mg/mL or ceftiofur concentrations of 25 mg/mL produced the optimal combinations of particle size and aerosol density when using a medical ultrasonic nebulizer.\(^\text{16}\) In healthy horses, aerosolization of 20 mL of the commercially available IV gentamicin sulfate solution (diluted to 50 mg/mL) using an ultrasonic nebulizer resulted in bronchial lavage fluid concentrations approximately 12 times higher than concentrations achieved by IV administration at a dose of 6.6 mg/kg.\(^\text{17}\) In the same study, serum concentrations following aerosol administration were below 1 µg/mL at all times.\(^\text{17}\) Once daily aerosol administration of gentamicin to healthy horses for 7 consecutive days did not result in pulmonary inflammation or drug accumulation in the respiratory tract.\(^\text{18}\) The major limitation to the use of aerosolized gentamicin in horses is its lack of activity against *S. zooepidemicus*, the most common bacterial pathogen of the equine respiratory tract. Aerosolized ceftiofur sodium would be appropriate for use against *S. zooepidemicus*. Additional studies are required to assess the efficacy of aerosolized antimicrobial agents for the treatment of bacterial respiratory tract infections in horses.

**Ancillary Treatments**

The need for ancillary treatments depends on the severity of the disease and is most often necessary in horses with pleuropneumonia. Nonsteroidal anti-inflammatory may be beneficial to minimize inflammation, provide analgesia, and control high fevers. Additional analgesia may be necessary in horses with severe pleurodynia. Adequate hydration should be maintained in patients receiving these agents for extended periods especially if aminoglycosides are used concurrently. Intravenous fluid therapy may be necessary to correct hypovolemia in acute stages but it is rarely required for chronic cases. Intrapharyngeal insufflation of oxygen is indicated in horses that remain severely hypoxemic despite adequate drainage of the pleural cavity. Adequate parenteral or preferably enteral nutritional support via a nasogastric tube is beneficial in horses that remain anorectic for several days. In horses presented with severe systemic illness, additional therapies aimed at treating endotoxemia may be beneficial.
Pleural Drainage

Small amounts of pleural effusion may be resorbed quite readily with appropriate antimicrobial therapy. Therefore, while a small sample of pleural fluid is useful diagnostically, pleural drainage is not necessarily indicated in all cases of pleuropneumonia. Drainage of pleural effusion results in removal of exudate and debris, and allow for reexpansion of the lungs. Indications for drainage include a poor response to conservative therapy or the presence of pleural fluid with at least one of the following characteristics: (1) Sufficient volume to cause respiratory distress, (2) empyematous character, (3) fetid odor, or (4) cytological or biochemical evidence of sepsis. If indicated, the procedure should be attempted as early as possible before deposition of fibrin results in loculations and impairs drainage. Pleural drainage is best performed using ultrasound guidance to determine the most appropriate site as ventral as possible. Pleural drainage can be accomplished either with intermittent thoracocentesis or indwelling chest tubes with Heimlich valves.

Thoracotomy

Surgical intervention in horses with pleuropneumonia is not a substitute for adequate medical management but, in carefully selected cases, it can save the lives of horses that would have to be euthanized otherwise. The criteria for surgical interventions include: (1) failure to respond to antimicrobial therapy, pleural drainage, and pleural lavage, (2) stable systemic medical condition, (3) presence of a large amount of fibrin, debris, or pus in the pleural space, and (4) either a walled off lesion or presence of a complete mediastinum to avoid creation of a bilateral pneumothorax. Surgical intervention is most beneficial in chronic cases with large unilateral localized pockets of thick debris, especially if there is resolution or at least a significant improvement of the disease in the opposite hemithorax. Before surgical exploration, the nature and location of the lesion must be thoroughly characterized by ultrasonography or thoracoscopy to determine the ideal surgical site. When there is bilateral disease, thoracotomy is performed on the most severely affected side. If necessary a second thoracotomy can be performed on the opposite side at a later time. Thoracotomy is typically performed with the horse standing. It is common practice to place a large chest tube into the targeted cavity and leave it open to atmospheric air for at least 2 h before thoracotomy. The onset of respiratory distress indicates development of bilateral pneumothorax in which case standing thoracotomy is contraindicated and pneumothorax must be corrected. Unilateral pneumothorax is usually well tolerated.

Prognosis

The prognosis for survival and return to normal athletic function depends on the severity and duration of clinical signs prior to therapy. Horses with septic inflammatory airway disease or mild to moderate bronchopneumonia have a very good prognosis for a return to previous athletic performance. The prognosis for horses with pulmonary abscesses and without concurrent pleuritis is also good. In one study, 45 of 50 (90%) adult horses with pulmonary abscesses survived. In the same study, 92% of Standardbreds and 52% of Thoroughbreds raced after treatment of pulmonary abscesses. For horses that returned to racing, performance after successful treatment of lung abscesses was not significantly different from that before the illness.
In a retrospective study of 327 horses with pneumonia or pleuropneumonia, the overall survival rate was 75%.

In cases of pleuropneumonia, retrospective studies have shown survival rates ranging from 43.3 to 87.6%.

Differences in survival rates between studies may reflect differences in referral populations as well as advances in therapy in more recent years. Many horses that would have been euthanized due to chronicity and lack of response to medical therapy several years ago are now successfully treated with the surgical approaches described above. This is evidenced by a retrospective of 153 horses with pleuropneumonia in which the survival rate was 95.7% when horses electively euthanized were excluded.

References


