Investigating Outbreaks of Respiratory Disease in Older Foals

Debra C. Sellon, DVM, PhD

Respiratory disease outbreaks in foals between 1 and 9 months of age are a common problem on breeding farms. A systematic approach to identification of primary and secondary respiratory outbreak pathogens and correcting predisposing management and environmental problems can limit economic losses and decrease morbidity and mortality on most farms. Author’s address: Department of Veterinary Clinical Sciences, College of Veterinary Medicine, Washington State University, Pullman, WA 99164. © 2001 AAEP.

1. Introduction
Respiratory tract infections manifested by cough and mucopurulent nasal discharge are a common reason for owners to seek veterinary care for older foals and weanlings. A survey of equine veterinarians in multiple states in the 1970s suggested that approximately 9% of foals are affected by some type of pneumonia. Mortality rate among affected foals was estimated to be 12%, or 1% of the total foal crop. A more recent study of Thoroughbred foals in Ontario, Canada revealed an incidence of distal respiratory tract infection in 82% of foals, with most episodes occurring in July and August. Respiratory tract infection can have a negative impact on a foal’s future athletic performance and may predispose to development of chronic obstructive lung disease or exercise-induced pulmonary hemorrhage later in life.

While many outbreaks of respiratory disease in foals are infectious in nature, this is not always the case. Environmental factors can have a profound impact on respiratory tract inflammatory disease. This article will discuss an approach to investigation of respiratory disease outbreaks in older foals and provides guidelines to minimize the impact of this common problem in growing horses.

2. Outbreak Pathogens
A systematic approach to investigating an outbreak of respiratory disease among young horses is recommended (Tables 1 and 2). The first goal is a careful evaluation of the nature of the problem, aimed at determining if a primary respiratory outbreak pathogen is present in the herd. These are pathogens that can cause outbreaks of respiratory disease without major predisposing environmental factors (see Table 3). (This does not mean that environment is not important in managing these diseases, but only that they are primary contagious or infectious diseases that can spread easily within a herd.) In outbreaks attributed to primary respiratory outbreak pathogens, the majority of young horses with signs of respiratory tract disease in that herd will be affected with the same pathogen. If primary pathogens are identified, specific control measures (including appropriate environmental changes) should be implemented. Examples of primary respiratory...
outbreak pathogens include respiratory viruses, parasites, Rhodococcus equi, and Streptococcus equi equi.

In contrast, secondary respiratory outbreak pathogens affect horses as a consequence or sequelae of primary environmental and management problems. The respiratory signs may be associated with airway inflammation in the absence of infection, or there may be a wide variety of secondary pathogens (usually bacterial) affecting foals. If a primary environmental problem with or without secondary bacterial infection is suspected, environmental and management problems must be identified and corrected before the outbreak can be controlled.

3. History and Environmental Evaluation

Distal respiratory tract inflammatory disease is extremely common in horses during their first year of life. Obtaining a careful history and survey of farm management practices is an important first step in investigating outbreaks. Table 1 lists a variety of management factors that may influence the incidence of respiratory disease in foals 1–9 months of age. Tactful interrogation of owners, trainers, and breeders with close inspection of facilities, pastures, and medical records may provide important clues. Particular attention should be paid to cleanliness of pasture and stable areas, air quality, population density, and preventive medicine practices.

4. Physical Examination

Careful physical examination of individual affected foals is important. Watch foals at rest in their natural environment prior to hands-on examination. A more accurate respiratory rate is obtained and the foal’s general level of activity and vigor is assessed. Careful attention is paid to the pattern of respiratory effort and any abnormal inspiratory or expiratory noises associated with breathing. The external nares are evaluated for presence and character of nasal discharge. What is the character and frequency of coughing in affected foals? Is there evidence that the foal is eating and drinking appropriately, or suckling the mare if she is present?

<table>
<thead>
<tr>
<th>Housing</th>
<th>Nutrition</th>
<th>Handling</th>
<th>Preventive Medical Procedures</th>
<th>Weather</th>
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<tbody>
<tr>
<td>Population density</td>
<td>Insufficient quality or quantity of feed</td>
<td>Transportation</td>
<td>Vaccination schedules</td>
<td>Hot, dry, dusty</td>
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<tr>
<td>Ventilation</td>
<td>Insufficient vitamin E/selenium</td>
<td>Exposure to new horses</td>
<td>Deworming schedules</td>
<td>Heat, humidity</td>
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<tr>
<td>Bedding</td>
<td>Decreased milk production by the mare</td>
<td>Weaning</td>
<td>Parasite surveillance</td>
<td>Extreme temperature fluctuations</td>
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<tr>
<td>Disinfection between animals</td>
<td>Inadequate water intake</td>
<td>Veterinary procedures</td>
<td>Human fomites</td>
<td>Air pollution, increased inspired particulates</td>
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<td>Lack of access to clean grass pasture</td>
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<td>Stressful handling or training procedures</td>
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<tr>
<td>Comingling with transient populations</td>
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<td>Damp buildings</td>
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<tr>
<td>Dust, mold</td>
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<tr>
<td>Storage of hay and straw</td>
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<td>Poor sanitation</td>
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Table 2. Approach to Investigation of Respiratory Disease Outbreaks in Older Foals

1. Take history
2. Evaluate environment
3. Complete a physical examination of selected individual foals
4. Prioritize differential diagnoses
5. Perform specific diagnostic tests on affected individuals
6. Quarantine individual foals with primary pathogens
   a. Disinfect contaminated premises
   b. Separate caretakers or separate clothing
   c. Enforce frequent handwashing, good human hygiene
   d. Clean and feed last
7. Implement control measures specific to any primary outbreak pathogens identified
8. Treat specific bacterial or parasitic infections appropriately
9. Implement management changes to decrease airway inflammation
   a. Provide access to fresh green pasture
   b. Implement aggressive internal parasite control
   c. Minimize fly populations
   d. Ensure good ventilation if foals must be stalled
   e. Provide optimal nutrition
   f. Implement an appropriate vaccination program
   g. Maintain a closed herd or isolate young horses from transient population
10. Begin judicious use of corticosteroids if significant inflammation remains in the absence of active infection. Continue judicious use of immune stimulants if low-grade bacterial infection recurs after appropriate antimicrobial therapy.
A foal is approached and handled, a further assessment of respiratory rate and effort, nasal discharge, cough, and general attitude is made.

It is not uncommon for rectal temperature to be within normal limits in foals with respiratory tract disease, even in the presence of profuse mucopurulent nasal discharge or cough. The absence of fever does not rule out the presence of bacterial infection. The larynx and proximal trachea are firmly palpated to assess whether or not a cough is easily elicited. Sublingual, submandibular, and retropharyngeal lymph nodes are palpated for evidence of pain or swelling. Hydration status is assessed by evaluation of mucous membrane color and feel, capillary refill time, and eyelid skin tent. Dehydration can occur rapidly in foals that stop suckling or drinking, especially in a hot, humid environment.

Auscultation of the thorax is done at rest and with rebreathing. It is common for respiratory auscultation to be considered within normal limits at rest, even in foals with severe distal respiratory tract disease. In contrast, auscultation with a rebreathing bag is a very sensitive diagnostic test for detection of respiratory tract disease in foals. The most common abnormal sounds are inspiratory and expiratory crackles and wheezes in the cranioventral lung fields, extending caudodorsal to varying degrees. Dull areas may indicate pleural effusion, abcesses, or pulmonary consolidation. In addition to careful auscultation of all lung fields, the examiner should listen to the trachea during rebreathing for evidence of exudate, which is present in 98% of foals with distal respiratory tract disease. Foals with respiratory tract disease will frequently exhibit distress or coughing during a rebreathing examination, even though cough may not have been a clinical sign observed by the owner. Normal foals, once accustomed to the bag, should not be distressed during rebreathing and should not cough. The heart is carefully ausculted. Occasionally, foals exhibit clinical signs of pulmonary disease because of left heart failure associated with congenital or acquired disease. Presence of an abnormal murmur, jugular pulses, or peripheral edema may suggest the need for additional cardiac evaluation.

Evaluation of the gastrointestinal tract includes examination for evidence of oral ulceration, auscultation of borborygmi, and evaluation of the quantity and consistency of manure. Concurrent respiratory and abdominal disease may occur with R. equi, S. equi, and migrating ascarid larvae. Reactive arthritis characterized by multiple joint (synovial) distensions without severe lameness is not uncommon in foals with R. equi infections. A careful physical examination may reveal evidence of other immune mediated disorders in these foals, including uveitis, hypopyon, pale mucous membranes indicative of anemia, or petechial hemorrhages indicative of thrombocytopenia. Foals with S. equi may have classic signs of purpura hemorrhagica including petechial hemorrhages and painful edema of the distal limbs or abdomen.

### 5. Prioritizing Differential Diagnoses

A complete history, environmental survey, and physical examination of affected foals assists the veterinarian in developing a list of differential diagnoses ranked in order of likelihood for that farm. Prioritizing differential diagnoses provides a rational basis for selection of specific ancillary diagnostic tests. The veterinarian should first determine whether or not any of the primary respiratory disease pathogens are likely to be present in the herd.
Foals with *R. equi* or *S. equi equi* often have clinical signs or histories that are highly suggestive of the diagnosis. Many foals with *R. equi* infection exhibit little or no nasal discharge and may cough only infrequently. Presence of multiple non-painful joint distensions with fever and respiratory signs are typical of *R. equi*. Strangles infections are usually associated with very enlarged, painful external lymph nodes that ultimately break open to discharge a thick purulent exudate. Both of these diseases are associated with moderate to severe fever, lethargy, inappetance, and depression in affected foals.

Viral respiratory diseases tend to spread rapidly within a susceptible population. Affected horses usually have a high fever (>103°F) with a serious nasal discharge. Epidemiological evidence suggests that the classic respiratory viruses (equine influenza and equine herpesviruses [EHV]) are not associated with significant morbidity in foals <1 year of age. Most foals are EHV-4 seropositive, suggesting frequent exposure without accompanying clinical disease. Positive EHV-1 serum titers are less common in foals, but more likely to be associated with active infection. It is possible that herpesvirus infections are acquired from latently infected mares, making it very difficult to prevent infection in foals.

Evidence for the involvement of EHV-2 in foal respiratory tract disease is intriguing but inconclusive. EHV-2 has been associated with pharyngitis and conjunctivitis, keratoconjunctivitis, pneumonia, and might be a significant predisposing factor for *R. equi* infection. EHV-2 is more frequently isolated from the tracheal aspirate fluids of foals with respiratory tract disease than from normal foals but a cause and effect relationship has not been demonstrated. Foals from which EHV-2 was isolated from the tracheobronchial aspirates are characterized as having respiratory tract disease that was chronic and recurrent while receiving antimicrobial therapy, associated with several different bacterial pathogens, and clustering on particular farms.

Equine rhinovirus may be underestimated as a cause of respiratory disease outbreaks in horses. There are two serotypes of this virus, both of which have been associated with acute febrile respiratory disease in the horse. Because this virus does not cause typical cytopathic effects in culture, it may be overlooked in diagnostic investigations of respiratory disease outbreaks.

A history of inappropriate anthelmintic therapy in a densely populated herd is supportive of the possibility of ascarid infections. Lung damage from migrating larva may predispose to secondary bacterial infections. Pulmonary migration begins 7–14 days after ingestion of infective *Parascaris equorum* larva, but it requires 10–12 weeks for mature adult parasites in the small intestine to begin shedding oocysts. Therefore, it is not uncommon for substantial parasite infestation to be present, despite a negative fecal float for ova. Cohabitation of foals with donkeys is a risk factor for *Dictyocaulus arnfieldii* (lungworm) infections.

Poor environmental conditions in the absence of signs or history consistent with one of the primary respiratory outbreak pathogens suggests a primary management problem. A protracted history of low-grade respiratory disease that may be transiently responsive to a variety of antibiotics supports a diagnosis of environmental, allergic, or reactive airway disease. A single premises can also have multiple primary or secondary outbreak pathogens present, especially if management practices are suboptimal.

### 6. Ancillary Diagnostic Tests

In most herd outbreaks of respiratory tract disease, the diagnosis is not immediately obvious from initial examination. In these cases, one or more ancillary diagnostic tests are indicated. If a primary respiratory outbreak pathogen is suspected, a specific confirmatory diagnostic test or test(s) should be chosen (Table 4). If primary pathogens are considered unlikely, diagnostic tests may be selected to determine if there is a significant infectious component or if the problem is predominantly due to inflammation without active infection (e.g., allergic or reactive airway disease).

#### Complete Blood Count

In most older foals with undifferentiated distal respiratory tract disease, the complete blood count is within normal limits. A high white blood cell count and plasma fibrinogen concentration is indicative of a more serious bacterial infection such as those caused by *Rhodococcus equi* or *Streptococcus equi equi*. A serum biochemical profile is occasionally indicated if a foal has evidence of a more severe problem such as moderate to severe dehydration, endotoxemia, or multi-organ disease (e.g., diarrhea.

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**Table 4. Diagnostic Tests to Identify Specific Primary Respiratory Outbreak Pathogens**

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Test Options</th>
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| *Rhodococcus equi*        | a. tracheal wash culture  
b. herd screening by serology  
c. tracheal wash PCR       |
| *Streptococcus equi equi* | a. culture or PCR of purulent exudate from abscess  
b. culture or PCR of pharyngeal swabs  
c. culture or PCR of guttural pouch washes |
| Viral infections          | a. paired serum titers  
b. virus isolation from nasopharyngeal swabs and/or buffy coat |
| Parasitic infections      | a. quantitative fecal examination  
b. tracheal wash or bronchoalveolar lavage cytology  
c. history of anthelmintic use |
Transtracheal Wash

A transtracheal wash or bronchoalveolar lavage (BAL) are often indicated in the investigation of respiratory disease outbreaks. Both procedures provide an opportunity to assess the type and severity of inflammation in the distal respiratory tract, as well as providing samples for bacterial culture and sensitivity. The choice of technique depends on the experience of the veterinarian, working environment, primary diagnostic goals, and available equipment and supplies.

There are a variety of methods described for performing a transtracheal wash. A commercial kit with a 15-gauge trocar, 13-gauge cannula, and 14-gauge stiff flushing catheter that is 60 cm in length is convenient for performing a percutaneous wash (Table 5). The foal is appropriately sedated and restrained. An area of skin at the junction of the middle and lower thirds of the cervical trachea on the ventral aspect of the neck is aseptically prepared. The tracheal rings should be easily palpable. Subcutaneous tissue at the prepared site is infiltrated with local anesthetic (1–2 ml). A stab incision through the skin to the depth of the tracheal rings is made with a number 10 surgical blade. One hand firmly stabilizes the trachea while the other hand advances the 15-gauge trocar with cannula through the skin incision to a site between two tracheal rings. Firm pressure is needed to advance into the tracheal lumen. Pass the trocar and cannula distally in the lumen of the trachea until the hub of the trocar contacts the skin. Remove the trocar, leaving the cannula in place. Pass the stiff catheter down the cannula into the trachea. Inject 15–30 ml of sterile saline rapidly through the catheter into the lumen of the trachea. This usually precipitates coughing. Immediately aspirate as much as possible of the injected fluid. If no fluid is obtained, withdraw the syringe and catheter while continually aspirating. Repeat until a sample is obtained. A minimum volume of 1–2 ml of fluid is desired; more volume would be optimal. After obtaining the sample, withdraw the catheter through the cannula, then remove the cannula from the skin. The incision site may be closed with a simple interrupted suture or left to heal by second intention. If desired, a bandage may be placed over the site for 24 hours or until the skin has sealed.

A transendoscopic transtracheal wash is preferred by some clinicians.24,25 This technique avoids the risk of cutaneous infection or hemorrhage because no incision is necessary. A fiberoptic endoscope is advanced through the ventral nasal meatus into the trachea until the carina is visualized. A guarded swab or brush is introduced through the biopsy channel of the endoscope and used to sample fluids and secretions in the airway. Alternatively, a sterile protected aspiration catheter may be introduced to facilitate washing of the airway with sterile saline as described above.

Samples should be split and an aliquot submitted in EDTA containing tubes for cytologic evaluation. A second aliquot should be submitted for bacterial culture and sensitivity using appropriate sterile transport media (Table 5). Although transtracheal aspirate samples are reported to have poor correlation with histopathological lesions,26 there are obvious cytologic trends among horses with specific types of diseases.27 Cytologic assessment of neutrophilic inflammation with intracellular bacteria is most consistent with primary or secondary bacterial pneumonia.27 A Gram stain may provide useful information to guide initial antibiotic choices.

Neutrophilic inflammation in the absence of bacteria or degenerative changes in the cells is more consistent with reactive or allergic airway disease.27 Eosinophils most commonly indicate a parasitic lung infection in foals.21,22,27–29 However, in some horses, allergic airway disease may be characterized by an eosinophilic inflammation.28

Bronchoalveolar Lavage

BAL is the technique preferred by many clinicians for sampling of distal respiratory tract secretions. This technique does not require a skin incision and thus avoids the potential complications of infection and hemorrhage associated with percutaneous transtracheal wash techniques. Cytologic evaluation of BAL samples is more closely correlated with his-

Table 5. Product Supply List*

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Product Number</th>
<th>Supplier</th>
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<tbody>
<tr>
<td>Large animal tracheal wash kit, with stiff catheter</td>
<td>64905</td>
<td>Har-Vet, Inc.</td>
</tr>
<tr>
<td>BBL Port-A-Cul Envelope (1 tube medium, 2 swabs)</td>
<td>221607</td>
<td>Becton Dickinson Microbiology Systems Sparks, MD</td>
</tr>
<tr>
<td>Uterine swab (guarded)</td>
<td>KF3000</td>
<td>Kalayjian Industries, Inc.</td>
</tr>
<tr>
<td>BAL catheter with cuff</td>
<td>VBAL30</td>
<td>Bivona Veterinary Products</td>
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*Similar products may be obtained from other sources.
topathologic lesions than with transtracheal wash samples.

A BAL may be performed blindly with a specially designed BAL catheter or tube (Table 5), or through a 2–3-m fiberoptic endoscope. The foal must be appropriately restrained by physical or chemical means. The catheter or endoscope is passed via either nostril into the tracheal lumen. The instrument is advanced past the carina into a mainstem bronchus until it is wedged in a terminal section of lung airway. If a BAL catheter is used, the balloon tip is inflated with an appropriate quantity of water to “seal” the airway. Approximately 80–100 ml of sterile saline is injected into the lung segment via the catheter or the endoscope. The first 20 ml aspirated is discarded and the remaining sample collected into a clean syringe. The majority of injected fluid should be easily aspirated if the airway is well sealed. Before removing the catheter, the balloon tip must be deflated. BAL samples should be split for cytologic and microbiologic evaluation as described for transtracheal wash samples. EDTA is not usually necessary for cytologic specimens. BAL samples probably provide more reliable information about distal respiratory tract status than do samples obtained from the trachea. However, interpretation of cell types and inflammatory changes is similar to that described for transtracheal wash samples above.

In normal foals and horses the predominant cell type in a BAL sample is the alveolar macrophage. Although there is increased potential for contamination of samples by flora from the upper airway (because the tube is inserted through the nasal passages), specially designed guarded BAL tubes have consistently provided reliable microbiologic culture results for some clinicians.

Nasopharyngeal Swab

Nasopharyngeal swab samples may be useful for virus isolation or culture for identification of carriers of *S. equi* *equi*. The technique is simple and requires only minimal restraint in most foals. A guarded uterine type swab (Table 5) is introduced into the ventral meatus of either nostril and advanced to the pharynx. Presence in the pharynx is confirmed by observation of swallowing motions in the horse. The cotton tip is pushed firmly through the guard and swabbed on the pharyngeal mucosa. The instrument is removed from the horse’s nostril and the tip broken off into appropriate transport media for virus isolation, streptococcal culture, or general bacterial culture.

7. Quarantine of Affected Foals and Control of Infectious Disease Spread

If a primary respiratory outbreak pathogen is suspected or confirmed, appropriate quarantine control measures should be immediately instituted. Healthy horses in contact with clinically ill foals should be considered exposed and maintained in quarantine. Management techniques to limit the concentration of pathogens in the environment can be used to lessen the likelihood of spread. Most respiratory pathogens of foals are susceptible to common disinfectants and stable surfaces should be thoroughly cleaned and disinfected. Control of human and animal traffic through the quarantine area is essential. Ideally, individuals that care for healthy, unexposed foals should not be allowed to have contact with sick or exposed foals. If this is not practical or possible, healthy horses should be handled first, followed by exposed but not sick foals, and finally sick foals. Separate clothing, boots, stall cleaning equipment, and grooming utensils are recommended for each foal or group of foals. All barn personnel should be reminded to wash their hands with a disinfectant hand soap before and after handling foals.

New horses entering the farm should be quarantined for a minimum of 2 weeks before being allowed to mix with the resident population. Transient horses (e.g., mares arriving at a farm to be bred) should be maintained in a completely separate environment from the permanent populations. Age-matched groupings of horses is ideal. Broodmares should be maintained separately from weanlings and yearlings if at all possible.

Specific disease control measures may be indicated for some primary respiratory outbreak pathogens. There have been recent reviews of methods to decrease spread of *R. equi* and *S. equi* within a herd. If parasitic infections are suspected, the entire herd should be dewormed with an anthelmintic that will kill migrating ascarid larva (e.g., ivermectin, moxidectin, larvicalid fenbendazole). Methods for decreasing parasite burden in the pastures and stables should be discussed to decrease the chance of reinfection. A more appropriate deworming regimen should be instituted.

8. Treatment of Affected Foals

Bacterial infections should be appropriately treated in individual foals. *S. equi* zooepidemicus is the most common bacterial isolate from undifferentiated distal respiratory tract disease in foals. This organism is much less commonly isolated from the distal respiratory tract of clinically normal foals and decreases in number with appropriate antimicrobial administration, suggesting that it is a true respiratory pathogen in foals. In the absence of culture and sensitivity results, an antimicrobial efficacious against *S. equi* zooepidemicus should be chosen. A wide variety of other bacteria have been isolated from foals with respiratory tract disease. Some of the more commonly isolated are listed in Table 3. Empirical antimicrobial therapy may be attempted as initial therapy. If the antimicrobial is effective, improvement in clinical signs should be seen within 3–4 days. If the foal fails to improve, or if clinical signs are severe or progressive, a culture of tracheal wash or BAL fluid is indicated.
Immune stimulant therapy may be considered. There are very few controlled studies of the effectiveness of such agents, but anecdotal reports suggest they may be beneficial.35,36

9. Environment and Management Factors
Optimization of environment and management is probably the most important factor in prevention and control of respiratory disease outbreaks in older foals. Factors listed in Table 1 should be carefully reviewed with owners and managers to identify problem areas. Proper ventilation and airflow is probably the single most important factor in maintaining respiratory tract health.7,8,37 Although these factors have not been specifically examined in relation to foals, studies with young Thoroughbred horses in training suggest that lower airway disease is more common in horses bedded on straw.8 Fungal and actinomycete contamination of the air is greater in closed stalls with poor ventilation than in stalls with adequate natural ventilation (windows and back wall vents).7 These microorganisms are associated with allergic airway disease in older horses.38 Air particle counts are highest at the times stalls are being cleaned. In well-ventilated stalls, cleaning resulted in a two-fold increase in airborne particle counts; in poorly ventilated stalls, there was a 12.6-fold increase.7 Horses housed in poorly ventilated stables have more tracheal mucus and experience a longer mean duration of respiratory illnesses than horses in well ventilated stalls.7,8 This suggests that although healthy horses may be able to tolerate a wide variety of environmental conditions, poor air quality can significantly extend the convalescent period if respiratory infection occurs.8

The ideal environment for foals is probably continuous access to fresh green pasture in a thermoneutral climate. This is rarely available on a consistent basis. Therefore, recommendations must be made to optimize conditions within the financial and physical limitations of the premises and people involved. Some suggestions for improvement might include:

1. Bed horses on shavings rather than straw. Clean stalls regularly and completely, but do the cleaning while horses are outside the barn in paddock or pasture areas.
2. Store hay and straw in a separate building if possible. If this is not possible, consider storage at one end of a barn rather than in an overhead loft.
3. Optimize ventilation with windows, wall vents, mesh-type doorways, and so on. Judicious use of fans may improve airflow. Open stall gates to increase air exchange in the lower parts of the stall.
4. Sprinkle dusty paddocks with water to minimize aerosol formation.

Table 6 lists a variety of antimicrobials that may be used in older foals with respiratory tract disease.

Ancillary therapy is occasionally indicated. Judicious use of nonsteroidal anti-inflammatory drugs such as flunixin meglumine and phenylbutazone may be indicated in some foals to decrease pulmonary inflammation, reduce fever, and improve attitude and appetite. Hydration should be maintained orally or via intravenous administration of polyionic fluids. It is especially important to monitor this aspect of the foal’s condition if environmental temperature and humidity are high. Dehydration impairs mucociliary clearance of tenacious bronchial exudates. Occasionally, expectorants or mucolytics (nebulized or parenteral) may be beneficial. Foals with severe respiratory distress and hypoxemia will often benefit from intranasal humidified oxygen therapy. Nasal insufflation using a catheter placed to the level of the pharynx or percutaneously into the trachea is preferred over mask inhalation therapy. Bronchodilator therapy is controversial in foals with bacterial pneumonia. These drugs may exacerbate pre-existing ventilation-perfusion mismatch and worsen hypoxemia.

Occasionally, foals fail to respond to appropriate antimicrobial therapy and environmental improvements (discussed below). Discontinuation of antimicrobial therapy, followed by tracheal wash or BAL cytology and culture is indicated. In culture negative foals, judicious use of corticosteroids for a few days may be beneficial (e.g., dexamethasone at 0.02–0.1 mg/kg IM q 24 h). These potent anti-inflammatory agents can help break the cycle of inflammation in reactive airways. If recurring low-grade bacterial infections with a variety of pathogens persists,
5. Wet hay prior to feeding to minimize aerosolization of dust, fungus, and mold. Alternatively, feed pelleted rations or cubed forage.

6. Avoid extreme hot or cold temperatures. Good barn insulation will help keep the stable cooler in summer and warmer in winter. If horses are maintained outside, make sure that shade or shelter are available.

7. Maintain a reliable source of fresh water at an appropriate temperature to encourage adequate drinking (approximately 60–70°F).

To decrease the likelihood of introduction or spread of infectious diseases, resident horse populations should be maintained separately from transient populations. Whenever possible, maintain mare/foal pairs in small to medium size fixed herd groups of 10 pairs or less. Avoid high stocking densities that can increase likelihood of transmission of infectious agents. Avoid transport of foals during extremely hot weather. Socialize foals to human handling at an early age so that they will be less stressed by vaccination, deworming, foot care, and so forth. Develop an appropriate deworming program that includes regular treatment with larvical anthelmintics and regular fecal egg checks. Vaccinate appropriately for prevention of respiratory tract viral infection. If *R. equi* is present, institute specific control measures such as administration of hyperimmune plasma. If strangles is a problem, discuss a program to identify and treat apparent carrier horses.

10. Conclusions

Outbreaks of respiratory tract disease are extremely common in young horses and it is impossible to completely eliminate them in a herd. However, the incidence and severity of these diseases may be considerably lessened if veterinarians and farm managers work together to improve environment, management practices, and preventive medicine programs. A logical, systematic approach to identification of specific primary pathogens and improvement of environmental conditions will significantly decrease morbidity and mortality. Conscientious observations of foals for early signs of disease will further decrease morbidity and lessen the economic impact of disease.

References


