Inflammation is common in the lower respiratory tract of horses, as a result of their constant exposure to irritant material in the environment, the inhalation of cold dry air during intense exercise and exposure to a variety of infectious diseases. The most significant challenge for the clinician lies in detecting this inflammation when horses are not showing outward clinical signs of disease. Veterinarians are usually comfortable identifying the horse affected with Recurrent Airway Obstruction (RAO), as these horses by definition exhibit increased respiratory effort at rest, but it is much more challenging to assess the athletic horse showing no evidence of resting pulmonary dysfunction. Typically such an animal has been reported to suffer from exercise intolerance, poor performance and/or coughing when worked. Horses exhibiting this pattern of abnormalities are often suffering from a condition termed Inflammatory Airway Disease (IAD), and this condition is of increasing interest to owners, trainers and veterinarians who want to ensure that these horses are able to achieve their full athletic potential.

Stabled horses live in environments containing extremely high amounts of particulate material in the air, due to a combination of poor ventilation and dusty conditions. This exposure is worsened by the fact that they consume a diet primarily composed of hay, which contains dusts and mold spores that are potentially very irritating to the lower respiratory tract when inhaled. Human activity in the stable environment leads to increased exposure to aerosolized antigenic material, as well. Horses are exposed to potentially noxious gases as well, such as ammonia, and irritant material such as endotoxin in organic dusts. As horses are obligate nasal breathers the upper respiratory tract is able to filter out much of the inhaled particulate material and minimize the exposure of the lungs to these materials. Unfortunately this filtration system is not perfect, and very small particles (less than 5-10 microns in diameter) and gaseous materials are able to pass freely down the airways and reach the small airways and alveoli. These materials can initiate a non-specific immune response that culminates with the movement of neutrophils, eosinophils and/or mast cells into the alveolar and airway lumen and the increased production of mucus. These materials can initiate a non-specific immune response that culminates with the movement of neutrophils, eosinophils and/or mast cells into the alveolar and airway lumen and the increased production of mucus.

Further complicating this situation is the fact that young horses being introduced to active training are often naïve to respiratory viral infections such as equine influenza, rhinovirus and rhinopneumonitis. These young animals are introduced into environments containing large numbers of horses, many of which are frequently transported to other sites for competitions where they come into contact with other groups of horses. The end result is that young horses may suffer from clinical viral respiratory infections, subclinical infections or strong immune responses to viral agents. These conditions all can result in lower respiratory inflammation that can impair clearance of antigenic and irritant material from the lower respiratory tract. At the same time they are athletically active, which results in the inhalation of large volumes of air that exceed the ability of the upper respiratory tract to adequately warm and humidify the incoming air. This exposure of the lower respiratory tract to cold, dry air represents a strong pro-inflammatory stimulus and may be synergistic in the development of lower airway inflammation with the other risk factors previously discussed.

The clinical presentation of the horse with IAD is usually that of a horse with a history of poor performance, exercise intolerance (fading) or coughing, with or without excess tracheal mucus. These horses do not exhibit increased respiratory effort at rest, or any systemic evidence of infection, such as fever or an abnormal complete blood count. There is some evidence to suggest that coughing may be more common in older, non-racing athletic horses with IAD as compared to young racehorses. The most useful confirmatory diagnostic technique for evaluating these horses is bronchoalveolar lavage (BAL), as it gives information regarding the character and degree of inflammation in the small airways and alveoli. There is some debate regarding the utility of endoscopic evaluation for tracheal mucus, as this may be useful for detecting this condition, but BAL remains the gold standard. Endoscopy carries the advantage of being readily performed in the field, and these horses are often scoped anyway in order to assess for exercise induced pulmonary hemorrhage. The limitation of endoscopy is due to the subjective nature of this assessment, but horses with IAD will typically exhibit multiple specks of mucus along the trachea, a pool of mucus at the tracheal inlet or a continuous stream of mucus of variable width.
BAL cytology in horses with IAD demonstrates increased numbers of neutrophils (>5%), mast cells (>2%) or eosinophils (>1%) with increased mucus. If there is any suspicion of an infectious component a tracheal aspirate should be performed prior to the bronchoalveolar lavage and the sample submitted for cytology, gram stain and bacterial culture and sensitivity testing. Thoracic ultrasonography and radiography are of limited use in the diagnosis of IAD. Pulmonary function testing can provide additional information regarding the degree of pulmonary dysfunction and the presence of airway hyperreactivity, but this requires specialized equipment and is typically only performed in certain referral settings. A simple discriminatory test can be used to ascertain if a horse is affected by IAD versus RAO, and this is a hay challenge. Horses with IAD exposed to moldy hay may exhibit increased coughing and/or pulmonary neutrophilia on BAL, but they do not develop increased respiratory effort at rest, which would be consistent with RAO. Exercise Induced Pulmonary Hemorrhage (EIPH) can be difficult to differentiate from IAD, and may represent a contributing factor to IAD in some horses. EIPH is identified by the detection of blood on tracheal endoscopy after exercise, or the presence of large numbers of hemosiderin-containing alveolar macrophages on BAL.

The absence of fever or other systemic signs of infection can readily differentiate IAD from a number of other diseases, and these include respiratory viral infections, bacterial pneumonia, pleuropneumonia and fungal pneumonia. More challenging differentials can include equine multinodular pulmonary fibrosis (EMPF), neoplasia and lungworm (Dictyocaulus arnfieldi) infestation. Thoracic radiography is invaluable in identifying EMPF and pulmonary neoplasia, while direct examination of tracheal wash fluid represents the most reliable means of identifying lungworm infestations.

As IAD is associated with exposure to inhaled irritant and antigenic material it is fundamentally a disease associated with management, and no pharmaceutical therapy will be entirely effective in the absence of dietary and environmental modifications. A period of rest of 2-4 weeks duration can be helpful when initiating management changes and treatment in order to allow some time for the lower respiratory inflammation to subside in response to these changes. Simply changing the management scheme to avoid straw bedding and hay feeding can have a profoundly positive impact for many horses. Environmental management should also include stabling away from horses being fed hay and/or being bedded on straw, and maximal ventilation should be provided at all times. Do not forget to inquire about the location of hay or straw storage within the barn building, as proximity to these materials even without direct contact is sufficient to induce lower respiratory inflammation in some animals. Bedding with wood shavings or shredded paper is ideal, although other low dust materials such as cardboard may be available in some localities. Consideration should also be given to modifying management practices within the stable that may generate large amounts of respirable particulate material, such as using blowers to clear aisles and frequent sweeping. At the very least these activities should not be performed when horses are confined within the stable. In the perfect world we would manage these horses on pasture turnout, but that is rarely possible for horses in active training, regardless of discipline.

The most fundamental aspect of management for many affected horses is that hay must be replaced in the diet with some other form of roughage. Many owners/trainers will try to avoid hay replacement strategies, and soaking of the hay is a frequently considered option. This can be somewhat effective, but the soaking process is often im precise and insufficient. In addition, soaked hay is more prone to spoilage, especially in warm locales, which then exacerbates the exposure to mold spores. Alternatively this practice results in freezing of the hay in cold weather, leading to decreased client compliance and decreased feed intake by the animal. Steaming of hay can represent a viable option in some management schemes, and this appears to be very effective in minimizing the inhalation of irritant material from hay. The equipment required for steaming can be expensive, but may be cost effective over the long term. An added benefit of steaming is that this process does seem to improve palatability for many horses when compared to hay soaking. Chopped forage is easily substituted for hay in the diet, and this represents an excellent option for many horses. The primary long term limiting factor is often expense, however. Alternative approaches can include the feeding of a complete pelleted feed, alfalfa pellets or alfalfa cubes.

The cornerstone of treatment of IAD will always be management, but pharmaceutical approaches are needed to aid in arresting the inflammatory process and in situations where management cannot be optimized. Given that this condition results from an inflammatory/immune response the most effective way to control the inflammation is to use corticosteroids. Most of the work looking at inhaled corticosteroids in the horse has been focused on the treatment of RAO, but the same drugs appear to be beneficial in the management of IAD at lower dosages than are usually required for RAO. Inhaled corticosteroids are the safest approach, as they target the affected tissues and minimize the systemic levels of corticosteroids. The two primary aerosolized corticosteroids are fluticasone and beclomethasone, with fluticasone being the more potent of the two. These drugs can be readily administered using a variety of facemasks and nasal inhalers, as they come in metered dose inhaler forms. Fluticasone should be administered at 1-2 mg total dose every 12 to 24 hours, and 2-4 weeks of treatment is often
adequate to resolve the lower respiratory inflammation in conjunction with management changes. While fluticasone therapy can be very effective it is preferable to use systemic corticosteroids if long term administration is required, for reasons of client expense. The most effective systemic treatment is dexamethasone, which can be given IV or IM at 0.02 to 0.05 mg/kg once daily for initial treatment, or every other day for milder cases. Dexamethasone can be administered orally as well, and this is the author’s preference, but the dose must be increased approximately 50% to account for decreased bioavailability. Once clinical improvement is observed then dosing is gradually decreased over time, first by using the full dose every other day for a week, followed by 25%-33% reductions in the dosage every week or so, based upon clinical response. The goal should be to find the lowest effective dose administered every other day. Prednisolone can be used in place of dexamethasone, but due to the lower potency of this compound it may not be as clinically effective as dexamethasone. Dosing of prednisolone starts at 1.1 mg/kg once or twice daily by mouth until clinical improvement is seen, after which time the dose is tapered by 25-33% every one to two weeks until the lowest effective dosage is reached or the drug is discontinued. Treatment can be extended to every other day, but this is typically not as effective with prednisolone as it is with dexamethasone.

Bronchodilator therapy can be useful in managing the patient with IAD, but should not represent the cornerstone of long-term management. The reason for this is that bronchodilators only lessen the severity of airway hyperreactivity, but do not completely control the underlying inflammatory processes causing the disease. The danger in using bronchodilators is that they may allow the horse to work despite failure to resolve the lower respiratory inflammation responsible for airway hyperreactivity. The most commonly used bronchodilators in horses are the beta-2 adrenergic agonists, with clenbuterol being the most widely used. Clenbuterol is administered orally in incremental doses from 0.8 to 3.2 micrograms/kg every 12 h. Therapy should be discontinued after thirty days due to decreasing receptor sensitivity, but can be resumed after 2-4 weeks if required. Inhaled albuterol represents a reasonable alternative to oral clenbuterol, and this drug is administered at 600-720 micrograms total dosage every 6-12 hours. Anticholinergic bronchodilators may also be used, with ipratropium bromide representing the safest approach. This drug is administered by inhalation, either by metered dose inhaler (0.36 to 0.72 micrograms/kg every 8 to 12 hours) or nebulizer (2-3 micrograms/kg). This drug is more effective for long-term therapy than the beta-2 adrenergic drugs, however the best approach overall is to reserve bronchodilators for use as needed, or prior to when the horse is being worked, rather than use on a routine basis.

The long-term prognosis of horses affected by IAD is not well described, but there is some cause for concern that IAD could represent a precursor to RAO if not effectively controlled. Alternatively, there is some evidence that horses actually improve over time and are less likely to be affected as they age, likely due to the acquisition of appropriate immune responses to many of the antigens and infectious diseases that may contribute to the development of IAD in young horses. Control of IAD depends heavily upon the effectiveness of the environmental and dietary modifications implemented on the farm. Horses that continue to be exposed to hay, straw and contaminated stable environments can be expected to remain affected over time despite pharmaceutical therapies. For all of these reasons it is important that the response to treatment be closely monitored, and this often requires repeat evaluation of BAL fluid as these horses are not typically exhibiting much in the way of outward clinical signs. With optimal management many horses can improve in athletic function, although perhaps with some partial impairment in the form of exercise intolerance.

References

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