

Poor Performance Related to Lower Airway Problems

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Introduction

Performance abnormalities associated with the lung tend to be subtle. Classic clinical signs we note include: prolonged recovery, coughing with exercise, and reduced performance. Lung abnormalities can include infections which are obvious or just lower airway inflammation. Lower airway inflammation is much more difficult to diagnose. The two classic lower airway inflammatory conditions include reactive airway obstruction (RAO), previously identified as COPD, and inflammatory airway disease (IAD). Both conditions can present with similar signs, but IAD is potentially reversible/curable. RAO can cause severe clinical signs and generally is diagnosed in older horses. When subtle the signs will be very similar to IAD. Only IAD is discussed below, but the workup of RAO will be very similar.

Inflammatory Airway Disease (IAD)

Inflammatory airway disease impacts oxygen exchange at the alveolus. It develops in conditions of compromised air quality or inhalation of particulate material. A temporary post-viral IAD can also develop and impact performance. Because there are multiple inflammatory cells that can cause IAD, a bronchoalveolar lavage (BAL) is used to sample the cells deep in the airway. Determining the type of cell is important to identifying the most appropriate treatment. Mast cell mediated IAD does not seem to respond to corticosteroids as completely as a standard neutrophilic IAD. Unfortunately mast cell mediated IAD seems to be a common form of IAD in the western performance horse in our experience.

Collecting a BAL is a straightforward process that requires a small amount of equipment. We prefer to use a silicone (2.4 to 3.0 meter long and 10 mm in diameter) tube designed and sold for equine BAL, although a 3 meter fiberoptic endoscope can be used. The majority of the BAL tubes end up in the dorsal caudal lung field when passed blindly. If sampling of a cranial-ventral area is desired, endoscopy is the best option. As the BAL tube is occasionally into the esophagus or swallowed, it is preferable to have two tubes available. It is uncommon to perform a BAL and not have some coughing, so preparation of the owner is worthwhile.

A BAL samples the different cells in the airway of the lung. Assumptions are made that these specific cells are causing lower airway inflammation and impacting lung function. Plethysmography is the study and measurement of changes in volumes and can be used to measure the mechanics of lung function. Recently, Ambulatory-Monitoring Inc has developed a portable plethysmograph to measure lung volume at the nose via spirometry and to calculate lung volume by measuring thoracic expansion. Lung volumes at both locations should be equal, but when there is significant lower airway inflammation, the volume measured by thoracic expansion will exceed the amount of air moved into the airway. This difference is directly related to the amount of effort necessary to overcome the resistance of the bronchial edema and constriction secondary to inflammation. After an initial calibration of the machine, the horse is then exposed to incrementally increasing concentrations of histamine via nebulization. The histamine will induce

HOW TO COLLECT A BAL

1. Sedate the horse
2. Open and break the seal on five 60 ml syringes
3. Fill one 35 ml syringe with half saline and half carbocaine/lidocaine.
4. Restrain the horse
5. Fill the tube with the carbocaine mixture
6. Lubricate the cuffed end of the BAL tube and pass it in the medial nasal meatus. Staying dorsal is important to direct the tube down the trachea.
7. Once at the larynx – dispense a small amount of carbocaine to help numb the upper airway and limit coughing.
8. Pass the tube into the trachea. You can feel the tube “bounce” on the rings of the trachea and there should be little resistance.
9. Once in the trachea, pass the tube until it is wedged into an airway, dispensing small amounts of carbocaine along the way to limit coughing.
10. Once the tube is wedged, dispense the remainder of the carbocaine.
11. Completely fill the cough of the tube and inject 250 to 500 ml of saline via the three way stopcock. It is important to interpretation that a consistent volume of fluid be used for all BAL. The larger volume may sample a larger area, but dilutes the cells further.
12. Once all saline is injected into the lungs, remove it via syringe. You should notice a foamy appearance to the fluid from the surfactant in the alveolus. Continue to aspirate the fluid until a negative pressure is felt and no additional fluid can be collected.
13. Deflate the cuff and remove the tube.
14. Note and record the amount of fluid injected and recovered. A smaller percentage of the injected fluid seems to be recovered in patients with bronchial edema.
15. The fluid should be immediately processed or stored on ice until it can be processed.

a bronchoconstriction that is measurable with the plethysmograph. The results will be different according to the degree of airway reactivity. Horses with non-reactive airway disease respond with a measurable change to higher doses than horses suffering from a hyper-reactive airway disease. Horses with hyper-reactive airways will have a more exaggerated response at lower concentrations. The response to the histamine challenge is measured in a percent change from baseline. The PC50 is the concentration of histamine necessary to induce a 50% increase in the difference between thoracic volume and nasal airflow. In this manner the degree of airway hyper-reactivity can be quantified and then be tracked as an indication of improvement and response to therapy.

Therapy

The cornerstone of management of allergic airway horses is reducing the primary cause and environmental management. Reducing dust and allergens will go a long way to limiting medication need. Bedding horses on shavings instead of straw is great, but bedding on shredded paper when you can find it is even better. Frequent cleaning of the stalls is critical to limit ammonia buildup from urine. Air turnover and ventilation is very important if horses have to be kept in a stall. Some horses are so sensitive that you need to change the bedding on the adjoining stalls as well. Turnout is the best thing you can do for most allergic airway horses. Horses also get exposed to allergens from the hay. Feeding hay on the ground helps to limit how much the horse inhales while eating. Soaking or steaming hay helps to reduce the amount of dust and mold the horse is exposed to. Many performance horses in Texas are managed outside and fed appropriately and the exposure to the allergen/irritant is in the arena. In these cases it is very difficult to resolve the primary problem and medical management becomes more important.

When management is not working, corticosteroids are the cornerstone of therapy. Commonly used therapies include fluticasone inhalers. As the trade name Flovent, a 220 mcg per puff of a metered dose inhaler is used to deliver fluticasone via a spacer. Dosing regimens are very variable, but the author prefers to start with 6 to 8 puffs twice daily for one week and begin to taper down to a level that controls clinical symptoms. Beclate is a beclomethasone inhaler that is also frequently used. The advantage of inhaled corticosteroids include less drug residue and minimal systemic side effects. Systemic steroids will address many of the problems. Injectable and oral dexamethasone is used commonly at a dose of 0.2 to 0.5 mg/kg. The author tends to start at a 20 mg dose and taper down to 10 mg daily. As a very low dose of corticosteroids impacts adrenal function, we prefer to extend the dosing interval versus tapering off the amount given. Prednisolone is dose at 0.1 mg/kg and tapered in a similar manner. Prednisone is poorly and variably absorbed by the horse.

Initially bronchodilators, like clenbuterol or some of the inhalers, are important to control the symptoms but their long term use is not helpful. Overtime the horse develops a tolerance to these drugs and they are not effective. We use bronchodilators to open the airway in the initial stages of treatment and use steroids to keep the problem under control. When inhaled steroids are being given, we prefer to given inhaled bronchodilator. Albuterol is available in an inhaler and we typically give the same number of puffs as the steroid. Combivent is a trade name for a combined albuterol/ipratropium bromide inhaler. With two different mechanisms, the effect seems to be improved and the duration of the effect is longer. Inhaled bronchodilators are given before the inhaled steroid as it will open the airway and improve steroid deposition. Clenbuterol is the only approved oral option in horses for bronchodilation. A small percentage of horses fail to respond well to oral clenbuterol. Additionally at higher doses many systemic side effects (tachycardia and sweating) are common.

Mast cell stabilizers were also frequently used in treatment of mast cell mediated IAD. The availability of these inhalers is currently limited.

There are also a variety of supplements and anti-histamines that are used to control allergies. To date there are no good trials to prove or disprove the effectiveness of these products. In the authors experience they are not effective as a standalone product. Aleira, produce by Arenus, is a combination of ingredients purported to modulate the inflammatory response in the airway. In a small trial performed by the author, we noticed an improvement in the open pleth scores despite a lack of resolution of abnormal BAL findings.

Allergy shots can be effective in some horses. For an allergic airway, we prefer serum testing for the allergens we want to treat. The shots take at least 6 months to help and will not be an effective treatment for this season.

Conclusion

Subtle respiratory inflammation can impact performance. While a BAL can be performed by anyone with a little practice, additional tools are available in multiple referral facilities. Understanding the diagnostics available and beginning to identify these conditions are critical to making the diagnosis during a poor performance workup. An accurate diagnosis is important to prescribing the correct therapy or giving a correct prognosis. Consideration for

a pulmonary condition as a cause for poor performance should be considered when a musculoskeletal condition cannot be identified.