

# Respiratory Disorders of the Horse

Tara Hembrooke, PhD, MS

**The respiratory system serves several functions that range from gas exchange which supports energy metabolism and acid-base balance to filtering large airborne particulates. It also plays an important role in the development of systemic immunity. Diseases of the respiratory system are commonly diagnosed in horses. Non-infectious conditions including inflammatory airway disease, recurrent airway obstruction, and exercise-induced pulmonary hemorrhage require both medical and nutritional interventions for effective treatment.**

Inflammatory airway disease (IAD) and recurrent airway obstruction (RAO; also known as heaves) are nonspecific, inflammatory conditions of the lower respiratory tract. Horses with IAD and RAO present with clinical signs including coughing, excessive airway mucus, and bilateral nasal discharge, exercise intolerance and increased respiratory effort.<sup>1</sup> When RAO, the more severe form of IAD,<sup>2</sup> is present, afflicted horses are affected by more severe signs of labored or difficulty breathing due to mucus plugging and bronchospasm.<sup>3</sup> The etiology of either condition is unclear, however environmental influences, such as organic dusts and molds, are likely involved in both.<sup>1</sup> Exercise-induced pulmonary hemorrhage (EIPH) is often seen in racehorses and other equine athletes that perform at high workloads.<sup>4</sup> EIPH is thought to develop when pulmonary capillaries are damaged because of a high pressure gradient that develops between the capillaries and the pulmonary alveoli during high intensity exercise.<sup>5</sup> Inflammation in the lower airway may also exacerbate EIPH.<sup>5</sup> When severe, EIPH may significantly impair performance in equine athletes.<sup>6,7</sup>

## Environmental Therapy

Environmental management is an important factor in the treatment of IAD and RAO. Horses that are stabled in a dusty environment or that are housed near dusty arenas should be moved to a different location to reduce exposure to inhaled dust and mold spores. When changes in housing cannot be made,

the stable should be well ventilated, and the affected horse should be stalled as far away from the dusty environment as possible. Strategies to reduce inhaled allergens from hay can also help in the management of IAD and RAO. Aerosolization of dust and mold spores can be reduced by soaking forage before it is fed. Horses with EIPH are frequently treated with furosemide and occasionally are managed with a reduced workload, however these changes often do not completely stop the bleeding that is associated with exercise.

## Dietary Therapy

Because inflammation is a key component of IAD and RAO (and possibly EIPH) strategies to reduce and manage inflammation may prove helpful in alleviating symptoms and disease severity. Omega-3 fatty acids, which help modulate inflammation through the production of less potent inflammatory mediators, have been examined for their potential therapeutic effect in horses with IAD or RAO. Horses diagnosed with RAO were supplemented with seal blubber oil rich in the long chain omega-3 polyunsaturated fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).<sup>8</sup> After ten weeks, there was a significant reduction in pulmonary inflammation in the supplemented horses. Recently, a benefit of adding omega-3 fatty acids to a low-dust ration for horses with IAD and RAO was shown by researchers at Purdue University.<sup>9</sup> Horses supplemented daily with a

product containing 1.5 to 3 grams of vegetarian DHA demonstrated significant improvements in cough score, respiratory effort, and bronchoalveolar lavage fluid neutrophilia when compared to unsupplemented controls that were offered the same low-dust ration. The long-chain omega-3 fatty acids are not the only form of dietary omega-3 fatty acids. Flaxseed and flax oil contain a high concentration of the plant-based omega-3 fatty acid, alpha-linolenic acid, which also possesses anti-inflammatory properties.<sup>10</sup> In the horse, flaxseed oil supplementation has been associated with ex vivo decreases in the production of TNF-alpha,<sup>11</sup> a pro-inflammatory cytokine. The alpha-linolenic acid from flax oil may also prove useful in managing inflammation and clinical signs associated with IAD and RAO.

Free radicals are chemicals naturally produced in the body in response to normal metabolism as well as in response to rancid feed ingestion and inhalation of dust and air pollutants. Free radicals can damage cell structure and function. Antioxidants are critical compounds for terminating the activity of free radicals and repairing cellular damage. An endogenous antioxidant system (e.g. superoxide dismutase, glutathione peroxidase, ascorbic acid) helps to manage free radical damage, however an imbalance between antioxidants and free radicals can exist. Antioxidant supplementation (such as vitamins E and C, alpha-lipoic acid, curcumin or pterostilbene) might be beneficial for horses with inflammatory conditions of the respiratory tract. Ascorbic acid, a water soluble antioxidant, is naturally synthesized by the horse. It is found in high levels in the bronchoalveolar lavage fluid of healthy horses<sup>12</sup> but is measured in significantly lower concentrations in horses with RAO.<sup>13</sup> Exposure to organic dusts that exacerbate airway inflammation significantly increases the production of reactive oxygen species in the peripheral neutrophils of horses with RAO.<sup>14</sup> Furthermore, it has been reported that horses with IAD have altered glutathione peroxidase activity compared to healthy controls, suggesting an

imbalance in the oxidant/antioxidant status that could be managed with antioxidant therapy.<sup>15</sup>

## Conclusion

Respiratory disease in the horse is very common and can be a debilitating condition. For non-infectious conditions like inflammatory airway disease, recurrent airway obstruction and exercise-induced pulmonary hemorrhage, certain environmental management strategies, such as removal from a dusty stable situation and a reduction in intense exercise, may help to lessen the condition or lead to remission. Dietary therapy is a key management strategy that should also be included for horses with IAD, RAO and EIPH and includes supplemental omega-3 fatty acids and antioxidants.

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