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Equine COPD, Heaves, RAO, IAD: Understanding the Phenotypes of Equine Airway Disease

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The inflammatory syndromes that affect the lower respiratory tract of horses can be puzzling to practitioners who in their daily routine may be called upon to examine a pleasure horse that simply coughs a little at the start of exercise, a racehorse that has exercise intolerance and some excess mucoid secretions within its airways, or a horse with severe respiratory distress even when it is resting in its stall. All of these animals are showing signs of airway inflammation and, in most, these signs are not accompanied by signs of systemic involvement such as fever, increased leukocyte count in the blood, or elevated levels of fibrinogen. Over the years, these horses have been described by a variety of terms, including chronic obstructive pulmonary disease (COPD), heaves, recurrent airway obstruction (RAO), allergic airway disease, inflammatory airway disease (IAD), small airway disease, reactive airway disease, bronchitis, and bronchiolitis.

This plethora of names indicates a lack of understanding of the pathobiology of these syndromes and their interrelationships. Selection of populations of horses for research also was hampered by a lack of clear definition of the phenotypes of equine airway disease. Recent international workshops1,2 have defined three distinct phenotypes of airway disease as follows; recurrent airway obstruction (RAO, also known as heaves), inflammatory airway disease of racehorses, and inflammatory airway disease of pleasure horses. The term COPD should not be used in horses because the syndrome in people is caused by smoking and is accompanied by alveolar emphysema, which is not an important feature of RAO in horses. More accurate definition of phenotype has aided in selection of research populations and is clarifying the pathogenesis of airway disease.

Recurrent airway obstruction is a disease of mature horses that is caused by exposure to organic dust particles (usually in stables but sometimes outdoors)1. Dust exposure initiates an influx of neutrophils into the airways that is accompanied by airway obstruction as a consequence of bronchospasm, accumulation of mucoid secretions, and thickening of the wall of the airways in part as a consequence of smooth muscle hypertrophy. Generally, horses improve dramatically when they are removed from the source of dust, for example by placing them on pasture, but become worse again when re-exposed to the dust-rich environment. Horses not afflicted with RAO also develop neutrophilic inflammation in the airways when exposed to organic dusts, but in these animals the inflammation is much less severe. There is considerable debate about the mechanistic pathways involved in the excessive inflammation characteristic of RAO. There is evidence for involvement of endotoxin and innate immunity3; hypersensitivity reactions, TH2 immune pathways4, and mast cells5; and for genetic susceptibility. As a consequence of exposure of the airway epithelium to particulates and of the massive neutrophilic inflammation, reactive oxygen species are produced that also exacerbate the inflammation. Bronchospasm that is characteristic of RAO is a consequence of proliferation of airway smooth muscle that is hyperreactive to inflammatory mediators and neurotransmitters such as acetylcholine. Inflammation also increases the sensitivity of a cough reflex and decreases the clearability of mucus. Effective therapy requires reduction of inflammation by environmental management and use of anti-inflammatory agents, particularly corticosteroids. Bronchodilators are useful for short-term relief of airway obstruction (see following talk).
Inflammatory airway disease of racehorses is characterized by tracheobronchial accumulations of mucoid secretions that are sometimes accompanied by cough. The overall prevalence is 10-15%, but in a single stable prevalence can be up to 45%. Horses rarely have systemic signs of disease, but their racing performance may be affected if the mucoid accumulations amount to more than just a few drops visible within the trachea. Epidemiological investigations in the United Kingdom indicate that racehorses may have several bouts of IAD within a year, each lasting several weeks. The incidence decreases as horses age, suggesting the development of immunity to an infectious process. There is considerable evidence that recurrent bacterial infections, particularly with Streptococcus zooepidemicus, play a role in racehorse IAD, but serological investigations provide little support for involvement of viral infections. It is important to realize that inflammation and mucus production/secretion are very basic responses of the airways to any type of injury. In laboratory animals, pollutant gases such as ozone, inhaled endotoxin, a variety of types of particulates, allergens, and other agents either acting singly or synergistically can cause airway inflammation and excess mucus. It is therefore likely that there are multiple causes of IAD, and recent epidemiological investigations in the United States have shown a strong association between particulate concentrations in the air of racing stables and the prevalence of IAD (defined by the presence of mucus).

Inflammatory airway disease of pleasure horses has been most difficult to define. Because the majority of clinically normal horses have a high percentage of neutrophils in samples taken by tracheal lavage, it is recommended that elevated numbers of neutrophils in bronchoalveolar lavage coupled with evidence of lung dysfunction or poor performance be used to define the syndrome. One of the first presenting signs for the horse owner may simply be cough at the start of exercise, cough being a sign of airway inflammation. Endoscopic examination may also reveal excess accumulations of mucoid secretions, although a recent workshop did not include this as a defining criterion of the phenotype. There is a great need for extensive epidemiological investigations of the syndrome. In Michigan pleasure horses, the risk factors for IAD included age >15 years, feeding on hay (especially from round bales) as compared to pasture, and being outdoors for more than 80% time in winter (this is a very cold climate). Only half of the horses with mucous accumulation coughed.

Referencias


