

Medical management for lower airway inflammation

Stella Chapman, teaching fellow, school of veterinary medicine, University of Surrey, discusses the causes and possible ways in which to minimise the problem



A number of non-infectious respiratory conditions such as recurrent airway obstruction (RAO) and inflammatory airway disease (IAD) affect the stabled and pasture-kept horse. The nature of these conditions means that once affected, horses will require lifelong management that often encompasses the use of medical therapy. For the majority of cases, medical treatment is a short-term measure that is initiated whilst improvements to the horse's environment are instituted.

Defence of the airways

There are a number of anatomical barriers that provide the initial means of defence to airway inflammation. On a more cellular level there is also the innate and adaptive immune systems:

- Due to the horse being an obligate nasal breather, the upper respiratory tract is able to filter out much of the inhaled material from the surrounding environment, thereby minimising exposure to the lungs. Within the nasal cavity the turbinate bones, as well as the

Nebuliser in use

hairs lining the nasal passages are able to physically remove large particles. The cilia that line the more distal nasal passages act to engulf mucous and debris and sweep it to be ejected from the proximal nasal passages. Very small particles (less than 5-10 microns in diameter), however, are able to bypass this mechanism and reach the lungs, which in turn initiates a non-specific immune response.

- The innate immune system is able to mount a non-specific response to insult with macrophages (located in the alveoli and interstitium) that are able to phagocytize foreign material. The lungs themselves are able to mount both cellular and humoral adaptive immune responses with lymphoid tissue.

Bronchoconstriction and coughing are a direct result of response to the activation of irritant receptors in the airway epithelium. Mucous production increases and accumulation of mucous in the airways will lead to airway obstruction.

Treatment

Therapeutic goals should include:

- Immediate relief of bronchospasm
- Reduction of lower airway inflammation
- Reduce mucous production and airway plugging
- Reduce airway reactivity
- Long-term prevention of episodes

A treatment strategy needs to be in place with recognisable and achievable goals in place. Medical therapy can be broadly divided into drugs that reduce respiratory distress (bronchodilators) and those that reduce inflammation (corticosteroids):

Table 1. Advantages and disadvantages of aerosol therapy

Advantages	<ul style="list-style-type: none"> ● High local concentration of the drug in the affected tissues ● Lower total dosage requirements ● Rapid onset of action ● Allows the use of more potent drugs without increasing the risk of side effects
Disadvantages	<ul style="list-style-type: none"> ● Lack of access to restricted airways ● Problems associated with the use of unlicensed inhaled products in equine practice ● Cost of inhaled drugs can be prohibitively expensive

Bronchodilators

These are used to counteract bronchospasm; however they do not treat the underlying inflammation, and if large amounts of mucous are present, some obstruction of the airway will remain despite the use of maximal bronchodilation. Bronchodilators can be delivered both systemically and via inhalation, however inhalation is the preferred method.

Corticosteroid therapy

The use of corticosteroids remains the cornerstone of treatment. Corticosteroids activate glucocorticoid receptors, resulting in inhibition of the arachidonic

cascade and limiting production of leukotrienes and other inflammatory molecules. Response to treatment however, can vary considerably between horses. Corticosteroids can be delivered systemically (i.e. intravenous or oral preparations) or by inhalation. Owners must be advised of the association between corticosteroids and laminitis.

Aerosol therapy

In recent years, the use of inhalational devices has grown in popularity with regards to the medical management of lower airway inflammation. Table 1 shows the advantages and disadvantages of its use:

Inhaled products can be delivered by nebulisation or by hand-held metered inhalers (MDIs) or breath actuated inhalers (BAIs). All the devices have been adapted from human use and the choice with regards which to use, will largely be determined by the horse in question:

Jet nebulisers

This works on the principle that a liquid is placed at the bottom of a closed container and the aerosol is generated by a jet of gas. The liquid then emerges as a primary spray that contains a wide range of droplet sizes, with only the smaller droplets being carried from the nebuliser and into the airways. Not useful in horses due to the noise produced by the compressor.

Ultrasonic nebulisers

Ultrasonic vibrations create a fountain of liquid from which droplets are emitted. They can produce highly concentrated aerosols and are relatively silent. They are, however, fragile and expensive.

Mesh nebuliser

A nebuliser for the treatment of lower airway respiratory problems in the horse. Nebulisers in general are noisy; however Flexineb using vibrating mesh technology is silent and can also be adapted for

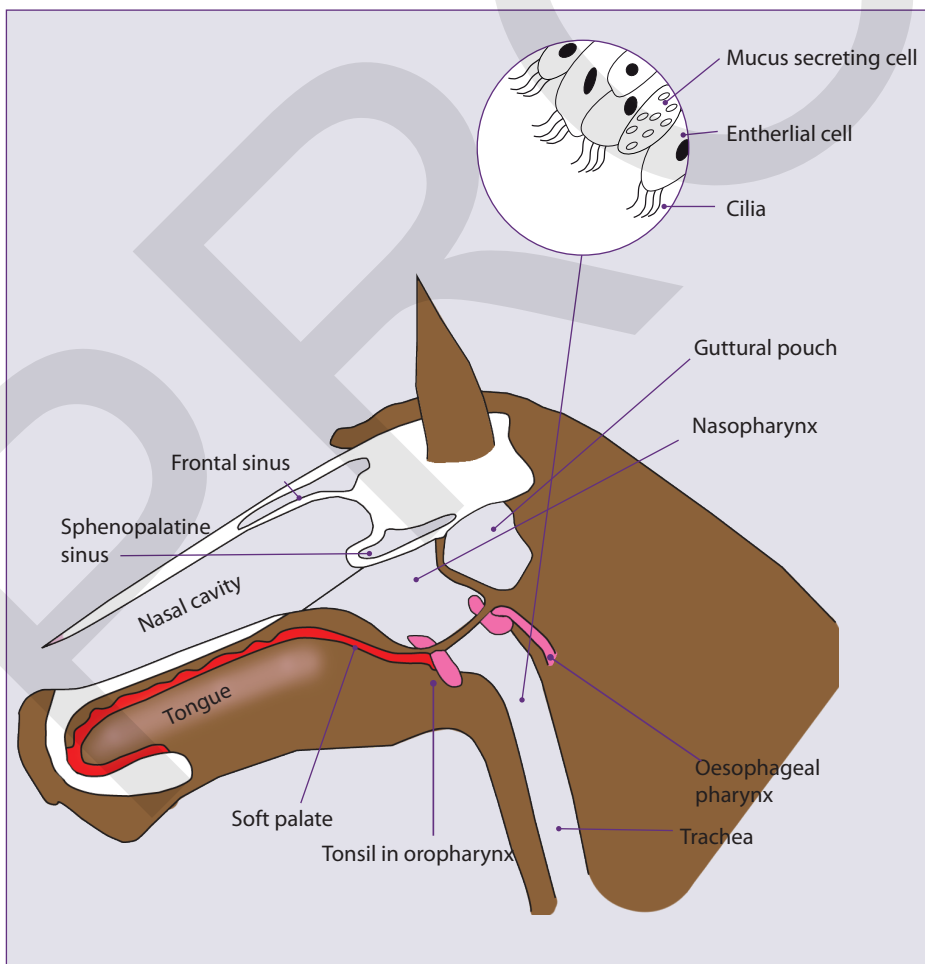


Diagram showing the nasal passages with inset of cilia which line the trachea



Owners should understand the importance of air quality, particularly in indoor barns

use with meter-dosed inhalers (MDIs). This allows a targeted, fine mist of an aerosolised drug to be administered to the horse. The nebuliser is also portable and easy to set up with no hoses, cords or valves, meaning it can be used in the stable itself.

MDIs

The active substance is placed into a compact aerosol container and via a metering valve, an accurate dose of the drug can be delivered during inhalation. MDI use in horses requires the use of a face-mask that acts as a connection between the inhaler and the respiratory system.

BAIs

These are designed to generate the aerosol when the airflow is sufficiently high to create air turbulences. For equine use it requires an airtight face-mask.

Whichever device is used to deliver the drug, it is important that the owner (operator) is given sufficient instruction with regards to its use.

Recommendations for treatment

Table 2 summarises the treatment recommendations from a review article conducted by Ivester and Couetil (2014) of the scientific reports available on RAO and IAD treatment efficacy:

Air hygiene

While horses will frequently require medical therapy in order to ease airway inflammation, it is imperative that horse owners understand the importance of the environment in which they are keeping

the horse. This is with particular reference to air quality. Advice on ventilation and potential sources of airborne allergens

Table 2. Recommended treatments

Treatment	Overall recommendation	Comments
Environmental management	Susceptible horses should be maintained under low dust conditions	Environmental modification provides the most consistent improvement in airway inflammation
Systemic glucocorticoids	Used to relieve clinical signs, airway obstruction and inflammation	Use of glucocorticoids without decreasing dust exposure will result in the recurrence of clinical signs within 3 days of stopping treatment
Inhaled glucocorticoids	Can be used to relieve clinical signs, airway obstruction and inflammation	Not indicated as a rescue medication; need for special equipment for drug delivery
Systemic bronchodilators	Due to their rapid onset of action, these drugs are suitable for rescue therapy during acute episodes	Their main use is to relieve bronchospasm and prolonged use is not recommended due to the risk of side effects especially with Clenbuterol
Inhaled bronchodilators	Can be used to relieve airway obstruction; rapidly alleviates bronchospasm and can improve pulmonary deposition of subsequently administered corticosteroids	Need for special equipment for delivery of the drug; prolonged use is not recommended
Complementary and alternative treatments	Antioxidants	No evidence to support their use
	Herbal products	Might be useful; further studies are needed
	Immunotherapy	Future research needed to confirm and identify allergenic triggers more specifically
	Acupuncture	No evidence to support its use
	Omega-3 fatty acid feed supplementation	Weak evidence to support its use; further research with placebo trials required

and irritants is as important as advice on the medication. It is also vital that owners appreciate the long-term consequences of even a brief exposure to airway allergens or irritants.

References

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Improving stable hygiene

By Dr Meriel Moore-Colyer

In her article, 'Medical management for lower airway inflammation', in this edition of *Equine Health*, Stella Chapman states that 'medical treatment is a short-term measure that is initiated while improvements to the horse's environment are instituted'. She goes on to emphasise the importance of obtaining good advice on ventilation and potential sources of airborne allergens. In a recent study of respirable dust levels in 72 stables, Auger and Moore-Colyer (2014) reported 17 to 19 times more dust when horses were on straw and fed dry hay compared with shavings and steamed hay. Stable management activities will create some airborne dust, but the major source is from the bedding and forage. Alternatives to straw bedding such as rubber matting and or shavings are now used by many horse owners. However, changing the fodder from dry hay to haylage is not suitable for many horses due to nutritional, shelf-life and

foraging behaviour constraints. Soaking hay before feeding will reduce respirable dust, but soaking leaches nutrients and increases bacteria content of the hay, compromising nutritional and hygienic quality. Steaming is a much better alternative to soaking as it reduces respirable dust by >95%, conserves nutrients and kills all mould and bacteria. However, there is steaming, and high-temperature steaming and these two versions have dramatically different outcomes. Research has shown (Taylor and Moore-Colyer, 2013) that partial steaming using either a kettle of hot water poured over the hay, or a home-made bin-type steamer, does not consistently or fully reduce the respirable particles and actually increases the bacteria content in the hay (partial heating acts as an incubator for microorganisms).



To effectively reduce respirable dust, remove all mould and significantly reduce bacteria concentrations, it is essential to ensure that high-temperature steam



HAYGAIN patented spiked technology

penetrates all of the hay for a minimum of 10 minutes an outcome only achieved using the patented spiked technology in HAYGAIN hay steamers. HAYGAIN's can be used to steam hay and haylage and consistently produce palatable, dust-free hygienic fodder thus removing potentially allergenic dust from the stable air. HAYGAIN hay steamers are available in 3 sizes and so large stables or single-horse owners can all benefit from the HAYGAIN technology.

Moore-Colyer MJS, Auger EJ (2014) The effect of design, and management regime on the respirable particle concentrations in 2 different types of horse stables. *Proceedings of the Equi Horse Facilities Conference Lion D'Angers, France, October 2014*

Taylor J, Moore-Colyer MJS (2013) The effect of 5 different wetting treatments on the bacteria and mould concentrations in hay for horses. *European Equine Health and Nutrition Congress, Ghent, Feb 2013*

Update on the advancing technology of Flexineb nebulisers

Since 2011 Flexineb has been helping to combat some of the most frequently occurring respiratory disorders in the equine species. Flexineb, portable equine nebuliser system with its blue flexible mask, battery powered control unit and 10 mls medication cup, have replaced the cumbersome, heavy nebuliser systems that were dominated by hoses and compressors. It is completely silent and lightweight so is well tolerated by horses and the flow rate is typically 1.0ml/min with 0.9% NaCl solution, but is dependent on the drug used.

As a result of communicating closely with veterinarians, trainers, riders and owners Nortev and Flexineb's UK distributor HAYGAIN are delighted

to announce the new and improved Flexineb 2.

The key benefits include:

- Longer Battery Life
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- New cable mechanism to make Flexineb even easier to use
- Improved Medication Cup life, through Flexineb's 2 novel and unique Automatic Tuning (AMT) feature.



Viscosity of liquids, volume of medication prescribed and environmental temperature are all factors that contribute to how well vibrating mesh technologies operate. Other technologies, including Flexineb 1, cannot react actively/during a treatment



Also compatible with MDI's

cycle to these external factors which can affect performance. Flexineb 2 can react via its AMT functionality, and therefore provides unrivalled control over critical parameters such as Treatment Time, Battery Life and Medication

Cup Life. Every 30 seconds the software and circuit board performs a scan to determine if corrective action is required, thereby ensuring both caregiver and patient have the best possible experience when administering inhalation care via Flexineb 2.

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