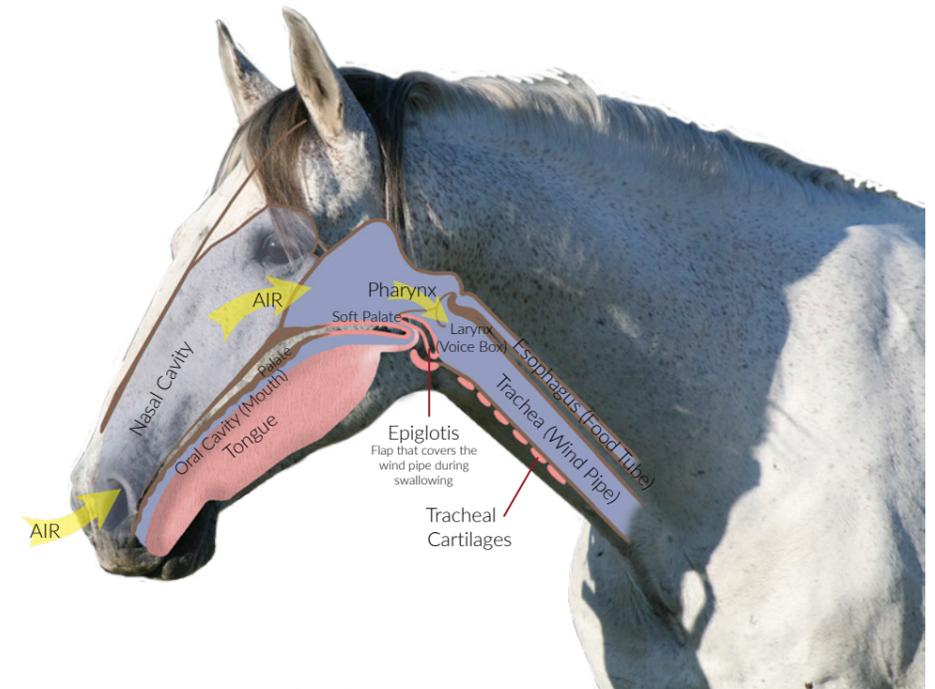




Photo by Linda Zupanc



ABOVE: The upper respiratory tract. Photo and illustration by Cristina Wilkins.

## Respiratory Conditions Part One

 Sarah Van Dyck  
BVSc, WestVETS  
www.westvets.com.au

Welcome to Part One of a new three-part series on respiratory conditions, presented by the team at WestVETS Animal Hospital & Reproduction Centre. This month, Sarah Van Dyck outlines the anatomy of the respiratory tract and respiratory conditions affecting the equine athlete. Correct diagnosis and treatment of respiratory conditions is integral to our horses performing at their best and maintaining long-term health.

Horses are truly impressive athletes and excel in a huge range of disciplines. A large part of what makes them great athletes is their anatomy, particularly their respiratory tract and musculoskeletal system. The horse's respiratory tract or breathing apparatus is a highly efficient organ that primarily functions to exchange oxygen for carbon dioxide and even a small problem with the respiratory tract can lead to a large negative effect in athletic performance.

### Anatomy

The respiratory tract is divided between the upper and lower respiratory tract. The upper respiratory tract includes the nares (nostrils), nasal turbinates, paired paranasal sinuses and guttural pouches, nasopharynx and larynx. The nasopharynx is the part of the respiratory tract that sits above the soft palate, which is an extension of the hard palate on the roof of the mouth. The soft palate normally sits just under the epiglottis of the larynx, which means that air must pass through the nose to enter the trachea. This is what makes the horse an obligate nose breather.

The lower respiratory tract includes the trachea and lungs. Air travels through the nares, past the turbinates, through the pharynx and larynx, down the trachea and then splits between the two primary bronchi (to the left and right lungs) into smaller airways called bronchioles, which then end in small sacs called alveoli where there is a thin membrane between the air and blood circulation.

### Function and physiology

The most important function of the respiratory system is to exchange oxygen for carbon dioxide and distribute oxygen to the rest of the body via the blood stream. This exchange occurs in the alveoli across a thin membrane. Across the thin membrane are concentration gradients, which lead to oxygen shifting out of the alveoli and into the blood, and carbon dioxide shifting out of the blood and into the alveoli to be breathed out.

The respiratory system also acts to warm, humidify and filter the air as it passes through the nares, ethmoid turbinates and pharynx. Large airborne particles are often caught by the mucous membranes in the upper respiratory tract and either swallowed or coughed up, whereas the smaller particles are destroyed by the body's immune system.

### Did you know?

At maximum exercise, the horse has the ability to move 1500 litres of air per minute through its airways.

The total lung capacity of a horse can be as high as 55 litres. That's a lot of air!



**ABOVE:** Endoscopy is a diagnostic tool for examination of the airways. Image courtesy WestVETS Animal Hospitals and Equine Reproduction Centre.

### Respiratory conditions

There are many different conditions that can affect the equine respiratory tract. Due to the large importance of the respiratory tract in athletic performance in the horse, any condition that may compromise the respiratory system can lead to a drastic reduction in performance. Any part of the equine respiratory tract may be affected.

Some of the more common respiratory conditions seen in the horse are listed below. However, this is certainly not an exhaustive list.

#### Infectious respiratory conditions:

- Viral infections (e.g. Equine herpesvirus or equine influenza),
- Bacterial infections (may be primary such as *Streptococcus* spp. or secondary),
- *Rhodococcus equi* (Rattles) in foals,
- Pneumonia and pleuropneumonia,
- Sinusitis, and
- Guttural pouch empyema or mycosis.

#### Non-infectious respiratory conditions:

- Inflammatory airway disease (excessive mucous in airways),
- Pharyngeal lymphoid hyperplasia,
- Exercise induced pulmonary haemorrhage (EIPH),
- Sinus cyst,
- Ethmoid haematoma,
- Left laryngeal hemiplegia (roaring),
- Dorsal displacement of the soft palate,
- Epiglottic entrapment,
- Subepiglottic cyst,
- Nasopharyngeal collapse, and
- Guttural pouch tympany.

### Exercise induced pulmonary haemorrhage (EIPH)

Pressure in the pulmonary blood vessels (blood vessels in the lungs) is 4 to 5 times higher when the horse is galloping compared to at rest. This is one reason that small blood vessels may rupture during exercise; this is known as exercise induced pulmonary haemorrhage (EIPH)

### Clinical signs of respiratory disorders

Respiratory disease can present with a number of different clinical signs. Some common clinical signs seen with respiratory disease are listed below.

- Coughing (dry or may produce mucous or blood) when exercising or at rest,
- Respiratory noise when exercising or at rest, which may indicate a partial obstruction, functional or structural problem,
- Increased respiratory rate (this can be normal in horses after exercise, but not at rest; normal resting respiratory rate is 8-15 breaths per minute),
- Laboured or difficulty breathing or shallow breathing,
- Reduced exercise tolerance or prolonged recovery from exercise,
- Nasal discharge of varying appearance (blood, mucous, pus, etc.),
- Swelling associated with structures of the head and neck (lymph nodes, facial bones associated with sinuses, guttural pouches, etc.), and
- Abnormal head carriage or shaking head.

### At full speed

During the canter and gallop, normal horses breath in time with each stride. This is called respiratory-locomotor coupling and is thought to give a mechanical advantage during respiration. The more rapid the strides, the more rapid the respiratory rate.



**ABOVE:** At the gallop, horses breath in time with each stride. Photo: www.shutterstock.com.

**FAR LEFT:** Nasal discharge is a sign of respiratory disorder. Photo by Cristina Wilkins.

**LEFT:** Exercise induced pulmonary haemorrhage (EIPH). Photo by Cristina Wilkins



### Diagnosis

Diagnosis of respiratory diseases or conditions can be challenging. A thorough clinical exam should be completed, which includes inspection of the head, lymph nodes, palpation of the airways and listening to the airways and lungs with a stethoscope and, in some cases, the application of a re-breathing bag over the horse's nostrils to increase lung excursion and amplify lung sounds.

In some conditions, a physical examination of the horse may be enough to gain a diagnosis. However, in most conditions, further diagnostic tools are needed to reach a diagnosis. Endoscopy is a diagnostic tool that is very useful to look at the airways during rest or, for some conditions, diagnosis needs to be made during exercise.

An endoscope is a device which allows visualisation of the airways through a long tube, which conveys images to a video screen or a hand held eyepiece. To diagnose some conditions, samples must be obtained from the airways, which may need to be sent to a laboratory for further analysis.

Many problems and diseases that involve the lungs, sinuses, guttural pouches, and related structures can cause nasal discharge. Nasal discharge is usually categorized in one of four major categories. These categories are serous (watery), purulent (coloured/ infectious), haemorrhagic (bloody or blood-tinged), and feed containing, or a combination of the above. Thick, coloured discharge is usually associated with an infection or abscess.

Bleeding during or after exercise is known as exercise induced pulmonary haemorrhage (EIPH) and is relatively common in racehorses. Pressure in the pulmonary blood vessels (blood vessels in the lungs) is 4 to 5 times higher when the horse is galloping compared to at rest, and this can result in the rupture of small blood vessels. Ethmoid haematoma is another cause of nasal haemorrhage.

Radiographs (or x-rays) are another diagnostic tool which is very useful for upper airway disorders, particularly within the sinuses of the head to detect fluid, masses and tooth root abscessation.

### Treatment

Treatment of respiratory conditions is varied and dependent on the condition and may range from surgery to antimicrobials and anti-inflammatories.

Keep an eye out for our follow up articles over the next two issue to read more detailed explanations of infectious and non-infectious respiratory conditions that affect our equine athletes, along with tips on diagnosis, treatment and management of these conditions.



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Dr Jane Groenendyk BVSc BSc  
Dr Linda Dillenbeck BVSc

**07 5464 4422**  
2401 Warrego Hwy, Marburg Qld 4346

**07 3202 7300**  
540 Mt Crosby Rd, Anstead Qld 4070