

# The Equine Respiratory System

*Understand the basic anatomy and function of the respiratory system and what can go wrong*

## Overview

Respiration is defined as the process of exchanging oxygen for carbon dioxide. As in all mammals, the most important organs for respiration in horses are the lungs where this exchange occurs. The other organs of the respiratory system are considered ancillary and serve primarily as conduits for the air to move from the environment to the lungs and vice versa.

Respiratory system dysfunction is an important cause of exercise intolerance and poor performance in horses. Abnormalities can exist at any point along the respiratory tract and include structural, functional, and infectious conditions.

## Structure of the Respiratory System

The respiratory tract commences at the nares (nostrils) and includes the nasal passages separated by the nasal septum, the paired paranasal sinuses and guttural pouches, and the nasopharynx (the region extending from the nasal passages to the trachea). The nasopharynx is located dorsal to (above) the soft palate, which is the anatomic extension of the hard palate (the roof of the mouth). The horse's soft palate is very long and extends from the termination of the hard palate to the base of the epiglottis. The epiglottis, therefore, lies on top of the soft palate, making horses obligate nasal breathers. That is, air cannot enter the mouth to reach the trachea because the soft palate blocks the airflow.

The epiglottis is one of several cartilaginous structures that make up the larynx (voice box). The other cartilages that form the larynx are the cricoid, thyroid, and paired arytenoid cartilages. Other important structures of the larynx include the aryepiglottic folds, the vocal cords, and the glottic cleft (the entrance to the larynx). The larynx demarcates the junction between the upper and lower airways and is located at the top of the trachea.

The trachea begins at the larynx and



Horses housed in a dusty environments are at greater risk of developing respiratory diseases.

travels down the neck and into the thorax (chest). Within the thorax the trachea divides into two tubes that are called the chief bronchi, each leading to one lung. Within each lung the chief bronchi further divide and subdivide, becoming narrower and narrower passages (i.e., the bronchi and bronchioles) in the lungs to ultimately end at the alveoli. Alveoli are microscopic air sacs located at the end of the bronchioles.

## Function of the Respiratory System

The upper and lower airways provide a passageway for air to and from the lungs, where respiration occurs. Air enters the nares, passes through the nasal passages where it is warmed and filtered free of debris, and enters the nasopharynx. Air then passes through the larynx via the glottic cleft and down the trachea to the alveoli.

It is in the alveoli that the oxygen in the inspired air diffuses across the extremely thin wall of the alveoli into the bloodstream

and where the carbon dioxide in the blood diffuses into the alveoli. The oxygenated blood in the lungs is then pumped back to the left atrium and ventricle of the heart and subsequently circulated throughout the body.

While the process of respiration appears outwardly simple, the integrated function of many nerves, muscles, cartilage, and other anatomic structures is essential to ensure the unobstructed flow of air to and from the alveoli. This is particularly important in horses exercising at high speeds.

## When Things Go Wrong

Considering the complex anatomy of the upper respiratory tract and the tremendous fluctuations in pressure that the upper respiratory tract endures, it is not surprising that respiratory tract dysfunction is so common, second only to musculoskeletal abnormalities. Some of the more common problems affecting the respiratory tracts of horses include infections (e.g., equine herpesvirus, rhinotracheitis, and strangles), laryngeal lymphoid hyperplasia (pimples), dorsal displacement of the soft palate (DDSP), nasopharyngeal collapse, laryngeal hemiplegia (roaring), epiglottic entrapment, exercise-induced pulmonary hemorrhage (EIPH), pneumonia, pleuritis, recurrent airway obstruction (RAO, also called heaves), and allergic airway disease.

Vets diagnose and treated each of these diseases differently (based on the underlying nature of the problem), and the prognosis is highly variable and dependent on the use of the horse.

## Diagnosis and Treatment

**Upper respiratory tract infections** Infections caused by viral or bacterial invasion of the upper respiratory tract are commonly diagnosed based on physical examination and routine blood work (complete blood count and blood biochemistry). These problems are usually self-limiting (they resolve

after running their natural course), but they can result in decreased performance and lost days of training. Infections can spread rapidly through a barn and affect many horses at once.

**DDSP, epiglottic entrapment, and laryngeal hemiplegia** In horses showing no signs of an infectious disease (they have no nasal discharge, fever, anorexia, or depression), and in which a structural abnormality is suspected, one of the most important diagnostic tools for evaluating the respiratory tract is endoscopy. In the standing unsedated horse, the veterinarian passes the flexible scope through the nasal passages to the nasopharynx. He or she carefully evaluates the soft palate and larynx, as these are where many of the abnormalities will be found. In some horses the source of the problem is not readily diagnosed at rest. These cases can be referred to a specialist to undergo testing on a high-speed treadmill and using videoendoscopy.

Once a diagnosis of any one of these abnormalities is made, surgery is generally indicated. The success rates are variable and exercise intolerance post-surgically, particularly for roarers or horses with

DDSP, uncommonly occurs.

EIPH Endoscopy is also a primary diagnostic tool for "bleeders" (horses that rupture small blood vessels deep in the lungs), as it helps the veterinarian to identify the presence of blood in the trachea that is coming from the lower airway. While there are no drugs currently licensed for the treatment of EIPH, affected horses are often managed medically (off-label and with variable success) with drugs, such as furosemide (Salix), and nasal strips.

**Pneumonia and pleuritis** Inflammation of the lung tissue (pneumonia) or the outer lining of the lungs (pleuritis) can be serious and life-threatening. Diagnosis in these cases relies on careful auscultation of the lung fields, blood work, and advanced diagnostics. Radiography and ultrasonography are useful; however, these services are not typically offered by ambulatory veterinarians. Horses diagnosed with pneumonia are aggressively treated with systemic antibiotics. Pleuritis often necessitates draining large volumes of fluid that have accumulated between the lungs and the body wall that prevent the lungs from expanding and filling with air. ◀

## FAST FACTS

- **The respiratory system** extends from the nares to the lungs, where respiration (exchange of gases) occurs.
- **Respiration** is defined as the exchange of oxygen and carbon dioxide between the environment (the air) and the blood.
- The respiratory structures that transport air to and from the lungs include the nares, nasal passages, nasopharynx, larynx, trachea, and bronchioles.
- Any abnormality along this passageway that limits the transport of air to and from the lungs, particularly during exercise, is problematic.
- Examples of common respiratory system dysfunctions include upper respiratory tract infections, DDSP, epiglottic entrapment, roaring, EIPH, recurrent airway obstruction (heaves), allergic airway disease, pneumonia, and pleuritis.
- **Diagnosis** is achieved via physical examination, blood work, endoscopy, and advanced techniques such as treadmill exercise, videoendoscopy, radiography, and ultrasonography.
- **Treatment** and prognosis are highly variable depending on the cause of the airway problem.

# Neutralize and Eliminate Harmful Ammonia Odor.

**Healthy Horse, Healthy Stall, Healthy Environment.** That describes the benefits of putting Sweet PDZ Horse Stall Refresher to work for you in your horse stalls.

Sweet PDZ is an all-natural, non-toxic and non-hazardous granular volcanic mineral that is a superior alternative to lime products for ammonia removal and moisture absorption. There is no masking scent or perfumes added to it. Sweet PDZ neutralizes and locks up ammonia and odors naturally, through mineral functions known as cation exchange, adsorption and absorption. It is a stall treatment that is efficient, economical and effective to apply to all bedding materials and stall floors. You simply sprinkle a covering of Sweet PDZ on the wet spots on a daily or routine basis. **Sweet PDZ will stretch your shavings, by keeping the bedding drier and performing better.**

Sweet PDZ is safe to handle with bare hands and is an "environmentally green" product when disposing of it. It is also a very **beneficial ingredient in the composting process**, as it captures the ammonia and converts it into a more nitrogen rich compost material.

**Sweet PDZ is proudly made in the U.S.A.** and has been the number one stall freshener on the market since it was first introduced over twenty-five years ago (1984). Sweet PDZ protects your horse's health, safeguards your stall environment and nurtures your earth.



**Sweet PDZ**  
HORSE STALL REFRESHER

For more information or a dealer near you:

800-367-1534 • [www.sweetpdz.com](http://www.sweetpdz.com)