Online HorseCollege

Student Workbook

3.H.14 Respiration System

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Contents

Respiration System 3.H.14 Workbook

Students are to complete Horse Care 3.H.09-12 online assessments prior to attempting Horse Care 3.H.13-16 and to follow all recommended safety considerations.

Practical assessments for Horse Care 3.H.13-16 are as follows:

A) Digestive System

B) Respiration System

C) Circulatory System

D) Injuries of the Musculo-Skeletal System

These assessments incorporate the following unit from the SIS30710 Sport Industry Training Package which include the listed elements

RGRPSH401A Relate anatomical and physiological features to the care and treatment of horses

- Identify basic anatomy and physiology of horses
- Relate anatomy and body systems to the performance of racehorses
- Follow illness and injury management plans

Further information about this assessment is available at www.training.gov.au

Respiration System Introduction

Respiration is necessary for life so it is an essential component to learn about horses' respiration system. This workbook introduces you to the basic components and processes of the respiratory system.

Respiratory System

The respiratory system has two functions (1) to move air in and out of the body (2) exchanging carbon dioxide for oxygen (gaseous exchange). A horse's respiratory system is quite extensive and efficient as the horse's survival in the wild relies on the horse being able to gallop quite fast.

Supplementary functions include heat regulation, voice production (communication) and smell recognition. This system is divided into upper and lower respiratory tracts, but function as one complete system.

The respiratory system is controlled by the autonomic nervous system that is, it is not under conscious control except for when the horse is sniffing to use its sense of smell. The breathing rate of an adult horse (at rest) is 10-15 breaths per minute. A number of different factors can alter the rate of breathing such as:-

- exercise
- severe pain
- fever
- heat stress

A horse can involuntarily hold its breath for a brief, temporary period. Instances when this may occur include:-

- when jumping (to permit impulsive action of jumping)
- to assist in defecation and urination during labour
- during post exercise recovery (pause in breathing followed by sighing to clear carbon dioxide)
- yawning
- during gait action to allow the horse to swallow without disturbing movement

Upper Respiratory Tract

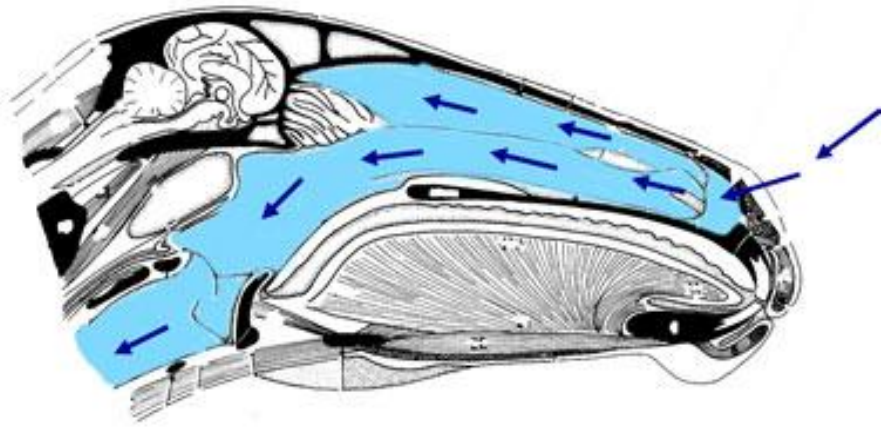
The upper airway begins with the nostrils, also referred to as the ‘nares’. The nostrils have cartilage under the skin to keep them permanently open, muscular attachments to this cartilage control the extent of the openings automatically and by reflex. During strong exercise or shortly after, the nostrils can be seen to be to be further extended or opened. This can also be seen when the horse is worried or frightened.

From the nostrils the airway continues as two nasal passages, these passages lead to three cavities, two facial and one skull, which are known as the para-nasal sinuses. These sinuses and passages are lined with mucous membranes and are efficient at warming and moistening inspired air thereby optimising temperature and humidity for gaseous exchange.

The nostrils open into the pharynx. The pharynx is a chamber where the respiratory and digestive systems meet and cross and is located at the end of the nasal and oral passages. The larynx (voice box) is an opening which attaches to and protects the trachea. It can increase the diameter of its cartilages to open and close depending upon the demand of oxygen. A structure known as the epiglottis can close over the opening, sealing it as the horse swallows to prevent inhalation of food.

The trachea is kept open by rings of cartilage and transports air to the lungs. Running down the midline of the neck it enters the chest (thoracic) cavity between the first two ribs.

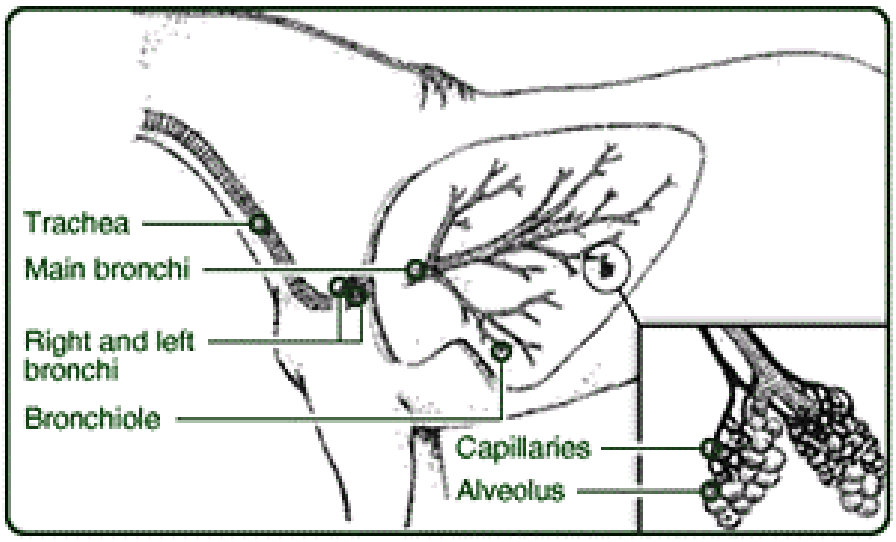
Horses are only able to breathe through their nostrils as the positioning of the soft palate prevents air entering the larynx to gain access to the trachea.



Lower Respiratory Tract

Air is directed to the lungs by the trachea. The lungs occupy a large area within the chest cavity and the shape of the chest is maintained by the ribs. From the end of the trachea branch two airways called bronchi. These are kept open by cartilage and supply air to the left and right lungs with the right airway being slightly larger. Once the bronchi reach the lungs (which transport oxygen from the atmosphere to the bloodstream) they further divide into bronchioles. Bronchi and bronchioles are encircled by smooth muscle which regulates the diameter or the bronchi and bronchioles autonomically (reflex).

From here are alveoli, these are closed sacs which neither expand or contract and are grouped extensions from the end of a bronchiole and are the primary site for gaseous exchange in the blood. These alveoli absorb oxygen from the air and release carbon dioxide waste.



Process of Respiration

For air to be inhaled a vacuum is produced in the chest cavity. This vacuum is created by the ribs expanding forward and outwards and the diaphragm (a muscular sheet of tissue which expands across the bottom of the rib cage) contracts which pulls it backwards.

Air enters via the nostrils, here it is warmed and particles of dust and debris are filtered and exhaled. The air then passes through the pharynx into the larynx and down the trachea. In the lower airways tiny hair-like projections called Cilia further trap smaller particles of dust and debris. Air moves through the bronchi and bronchioles into the alveoli. Oxygen from the inhaled air moves through the alveoli wall into the bloodstream whilst the carbon dioxide moves from the bloodstream into the alveoli. The carbon dioxide is the exhaled. To expel the de-oxygenated air from the body the diaphragm relaxes and falls forward, the ribs pull back and the lungs elastically recoil resulting in exhalation.

In a healthy, relaxed horse respiration is a quiet process with the phases of inhalation and expiration followed by a brief pause.

Extension Lesson

Take your horse's respiration rate before, during and after exercise.

Respiration rate before exercise: ……..

Respiration rate during exercise: ……..

Respiration rate after exercise: …….

Recommended Reading

Publication:-	Author:-
Veterinary notes for horse owners	Captain M. Horace Hayes
The BHS veterinary manual	P. Stewart Hastie

Websites:-

http://www.thehorse.com/pdf/factsheets/respiratory-system/respiratory-system.pdf

http://en.wikipedia.org/wiki/Respiratory_system_of_the_horse

References

Publication:-	Author:-
Veterinary notes for horse owners	Captain M. Horace Hayes
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Websites & Images:-

www.thehorse.com

en.wikipedia.org

www.flairstrips.com

www.equinekingdom.com