Question

The 3-year old stallion in the photo was recently treated by you for Strangles. He is now in isolation and the owner would like to know when he can safely reintroduce the horse to his stable. Which of the following should you tell the owner?

- It is best to wait until the horse has negative serology to antibodies against the SeM virulence factor
- Fortunately, Strangles is not contagious to other horses
- It is never safe to reintroduce the horse because most horses become lifelong carriers and shed the organism
- It is best to wait for 30 days after resolution of signs and then perform 3 consecutive weekly negative nasopharyngeal cultures
- He should vaccinate all of the horses at his stable and then reintroduce the horse 3 weeks later

Explanation - Strangles can be a difficult disease to control and vigilant preventative measures are necessary to minimize transmission as a small percentage of horses develop persistent infection of the guttural pouches associated with purulent inflammation or the presence of chondroids. These carriers can be detected either by culture or by detection of S. equi DNA using the PCR test. PCR is a more sensitive test but also more expensive and may have false positives in recently infected horses due to residual DNA from dead bacteria.

Investigation of carriers should be done either before a new animal is introduced into a stable or herd, or at least 30 days following recovery of a horse from strangles. Animals should be isolated until there have been 3 consecutive weekly negative cultures and/or PCR reactions.

If an animal is positive, endoscopic evaluation of the guttural pouch is recommended, chondroids removed, and guttural pouches treated by flushing and infusing 5 million units of penicillin G in 3% gelatin. In addition, these horses should be treated with penicillin G intramuscularly for 7 days, isolated for 30 days, and then retested with the 3 consecutive series of nasopharyngeal swabs and culture.

You should note that even this diligent recommendation is not 100% fail-safe. However, this is still the best answer choice. It is not true that most horses become lifelong carriers as this applies to <10% of horses. Waiting 90 days after resolution without testing or retreating is not recommended.

Vaccines against S. equi are available; there are intramuscular and intranasal vaccines available. The intramuscular vaccine is associated with pain and abcessation at the vaccine site as well as purpura hemorrhagica. The killed vaccine does not provide complete protection but it does reduce the severity of clinical illness. A live, attenuated S. equi vaccine has been introduced as an intranasal vaccine for the prevention of strangles. It is strongly recommended that other vaccines or injections not be administered at the same time as the intranasal vaccine. Since the live organism may persist in the nose, control measures that involve detection of carriers may not be effective in horses immunized with this vaccine.

Serology is best for determining the exposure status of a horse and is mainly used to aid in the diagnosis of purpura hemorrhagica and bastard strangles.

Question

Which of these receptors plays the most important role in causing airway dilation in response to catecholamine secretion?

- Beta-1 adrenergic receptors
- Alpha-2 adrenergic receptors
- Beta-2 adrenergic receptors
- Alpha-1 adrenergic receptors

Explanation - The correct answer is beta-2 adrenergic receptors. Beta-2 adrenergic receptors are abundant through the lung, and stimulation produces smooth muscle relaxation and bronchodilation. This can be exploited pharmacologically in bronchoconstrictive diseases, where giving a beta-2 agonist such as terbutaline can cause bronchodilation and reduce clinical signs. Beta-1 receptors are more important in the heart. Alpha receptors are less abundant in the lung and play no important role in regulation of airway diameter.

Question

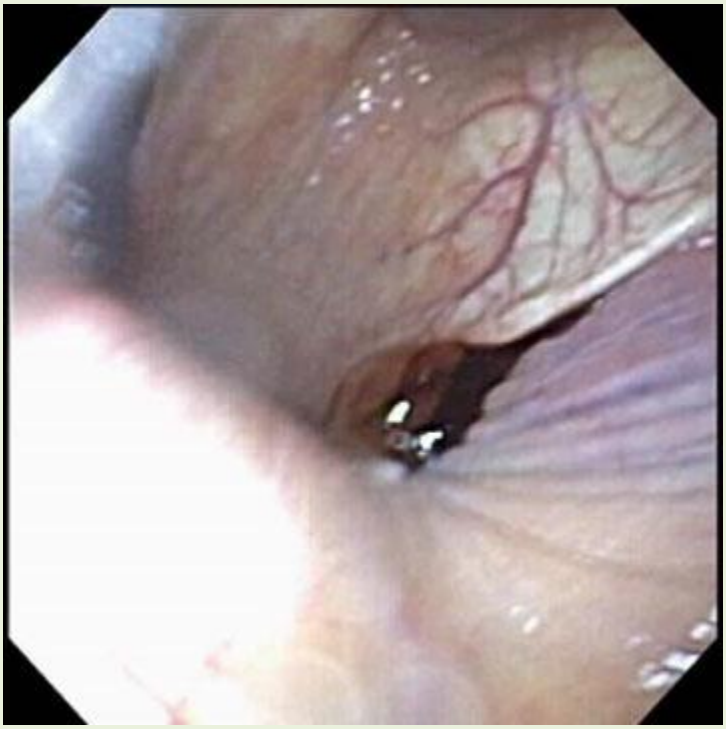
What is the definitive host of Dictyocaulus arnfeldi?

- Horse
- Donkey
- Wildebeest
- Rodents
- Sheep

Explanation - The correct answer is donkey. Dictyocaulus is the lungworm of horses. Horses housed with donkeys are at highest risk for acquiring the disease. In donkeys and in foals, Dictyocaulus is usually subclinical. The life cycle of the worm is that an infective larva is **ingested** and migrates through the mesenteric lymph nodes through lymphatics to the lung, where it develops into an adult and produces eggs that are coughed up, swallowed, and passed in the feces.

Question

You are examining a 7 year old Thoroughbred gelding for severe bilateral epistaxis. After the epistaxis has decreased, endoscopy of the pharynx reveals blood from the left guttural pouch opening (see image). What is the most appropriate treatment for hemorrhage from guttural pouch mycosis?



- Surgical occlusion of involved arteries (i.e. internal or external carotid artery) under general anesthesia

- Pass endoscope into affected guttural pouch and cauterize involved vasculature
- Tie off the left common carotid artery
- Lavage guttural pouch with antifungals

Explanation - Guttural pouch mycosis has several different clinical presentations. In some horses, epistaxis is observed, while in others, cranial nerve deficits such as dysphagia may be observed. When hemorrhage is present, the disease is advanced and more aggressive therapy must be pursued. In this case, surgical occlusion of the involved arteries is necessary (i.e. embolization coils or balloons). If you lavaged the guttural pouch in this case, you may exacerbate the bleeding. Passage of the endoscope may also disrupt the clot and cause further hemorrhage. Furthermore, cauterization of the vessels involved using an endoscope is not possible. Tying off the left common carotid artery seems like a good idea, but because of the circular blood flow in the brain, hemorrhage will continue.

Question

Which of these conditions can occur secondary to a streptococcus equi ssp. equi infection?

- Guttural pouch tympany
- Guttural pouch mycosis
- Ethmoid hematoma
- Guttural pouch empyema

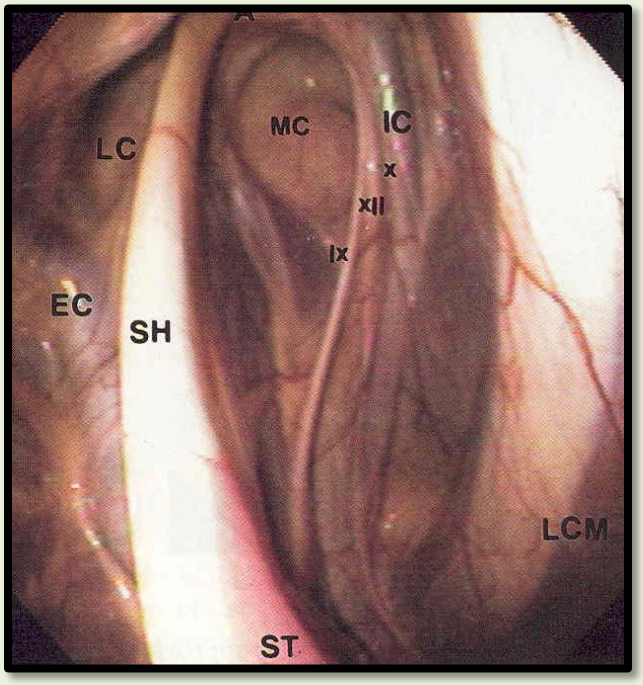
Explanation - The correct answer is guttural pouch empyema. With this condition, there is purulent material in the guttural pouch. It can occur from an infection through the pharynx, from a chronic respiratory infection, or via lymphatics, as is the case with streptococcus equi ssp. equi infection. Clinical signs include chronic nasal discharge, dysphagia, and leukocytosis. Guttural pouch tympany is an idiopathic condition of foals where a guttural pouch swells with air. An ethmoid hematoma is a non-neoplastic mass. Guttural pouch mycosis is a fungal infection.

Question

What structure is not likely to be affected with a guttural pouch infection of a horse?

- CN VII
- CN IX
- Carotid artery
- Cranial sympathetic trunk
- CN VI

Explanation - The correct answer is CN VI. This nerve does not run along the guttural pouch in contrast to the others listed. Remember, cranial nerves IX, X, XI, and XII travel through the pouch and may be damaged from mycotic lesions, thus resulting in dysphagia. Both the internal and external carotids may be affected during a guttural pouch infection. In case you don't remember, the guttural pouch in a horse is the air-filled diverticula of the auditory tube which communicates between the middle ear and the pharynx. Sometimes foreign material will get trapped there and result in infection.



- *Glossopharyngeal nerve (IX)*
- *Vagus (X)*
- *Accessory nerve (XI)*
- *Hypoglossal nerve (XII)*
- *Sympathetic trunk*
- *Cranial cervical ganglion*
- *Internal carotid artery*

Question

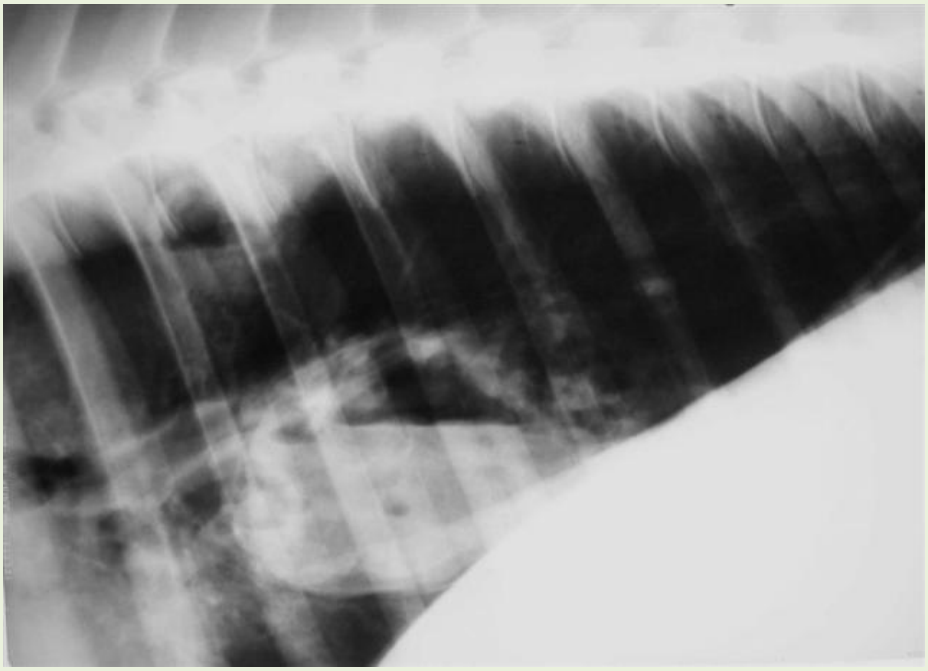
You are performing endoscopy of the guttural pouch of a 6 year old Quarter Horse gelding presented for dysphagia (see image). What is the most likely causative organism?

- Histoplasma
- Cryptococcus
- Aspergillus
- Coccidioides

Explanation - Aspergillus is the most commonly identified fungal pathogen in guttural pouch mycosis. While this disease can present with epistaxis, dysphagia is sometimes a presenting complaint. Remember, cranial nerves IX, X, XI, and XII travel through the pouch and may be damaged from mycotic lesions, thus resulting in dysphagia. If you are unfamiliar with endoscopic images of the equine guttural pouch, the mycotic lesion is seen from approximately 1 to 7 o'clock while the stylohyoid bone is evident in the left side of the image.

Question

Below is a lateral thoracic radiograph of the caudodorsal lung field of a 4-month old foal with clinical evidence of weight loss, fever, and tachypnea. What is the best diagnosis based on the clinical signs and radiograph?



- Congestive heart failure
- Rhinopneumonitis pneumonia
- Pulmonary carcinoma
- Pulmonary abscesses

Explanation - The two horizontal lines represent fluid or pus capped by gas within cavitary lesions. In foals, this occurs most frequently with Rhodococcus equi pneumonia.

Question

One of your clients recently purchased a horse that she plans to add to her stable. She is concerned about potential exposure of the horse to Streptococcus equi subsp. equi. Which of the following is the most sensitive test for detecting carriers of the disease?

- Guttural pouch culture Columbia CNA (colistin, nalidixic acid) agar with 5% sheep or horse blood
- PCR of a guttural pouch wash for the S. equi M protein (SeM) gene
- Nasopharyngeal culture on Columbia CNA (colistin, nalidixic acid) agar with 5% sheep or horse blood
- Serology for antibodies to S. equi M protein (SeM)

Explanation – The correct answer is PCR of a guttural pouch wash for the S. equi M protein (SeM) gene. Testing for Streptococcus equi subsp. equi can be complex. The 3 major tests are PCR, serology, and culture. PCR and serology both detect SeM which is an important virulence factor for the bacteria. Culture is best performed on Columbia CNA agar with 5% sheep or horse blood.

While there are pros and cons to each test, the key to answering this question correctly is focusing on the issues of sensitivity and detecting carriers.

PCR is approximately 3 times more sensitive than culture. In general, sampling the guttural pouch is a better way to detect carriers than the nasopharynx because it is where most carriers harbor the organism.

Serology is the best test for assessing exposure but is not a good tool for detecting carriers. This is because antibodies may be elevated after an infection has been cleared or even after vaccination. It may also be falsely negative if an exposure was recent.

To summarize the best uses of culture, PCR and serology:

Culture is the gold standard for diagnosing a horse with an infection.

PCR is best for detecting asymptomatic carriers, establishing infection status prior to or following transport, and to determine the success of elimination of S. equi from the guttural pouch. PCR cannot distinguish live DNA from dead DNA and may have false positives after a cleared infection. Using PCR in combination with culture may be helpful in such an instance.

Serology is best for determining exposure and the need for vaccination as well as for supporting diagnoses of S equi associated purpura hemorrhagica or of bastard strangles.

Question

Which of these parasites would be most likely to predispose a 2 month old foal to development of pneumonia?

- Parascaris equorum
- Strongylus vulgaris
- Strongyloides westeri
- Dictyocaulus arnfeldi

Explanation - The correct answer is Parascaris equorum. This is a roundworm that undergoes migration through the lung. It is common in foals, and during its migration, it can damage the lower respiratory tract and carry in bacteria. Dictyocaulus is the equine lungworm, but it generally does not cause clinical signs in foals; however it can cause cough and respiratory signs in adults. Strongylus and Strongyloides are gastrointestinal parasites and do not migrate through the lungs.

Question

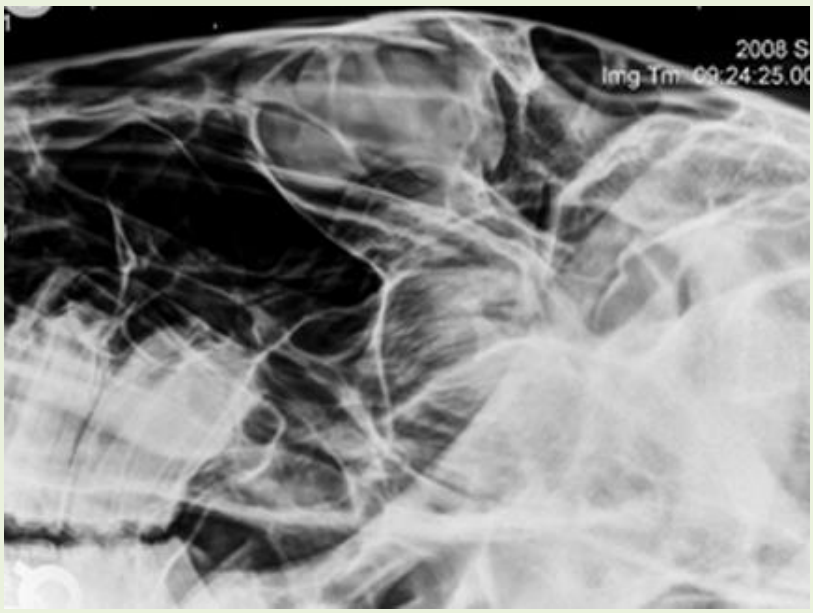
A 3 month old foal presents to you with a cough. On your exam, you note that the horse has a respiratory rate of 50, temperature of 103F, and has wheezes on auscultation. You also note abdominal tucking on inspiration. You perform thoracic radiographs and find an alveolar lung pattern with multifocal nodular, cavitary regions. What is your most likely diagnosis?

- Pneumocystis carinii
- Aspiration pneumonia
- Rhodococcus (Corynebacterium) equi
- Streptococcus equi ssp. equi

Explanation - The correct answer is Rhodococcus (Corynebacterium) equi. The signalment and clinical signs are most consistent with Rhodococcus equi infection. The radiographic finding of an alveolar pattern with multiple nodular regions is very indicative of Rhodococcus infection causing suppurative pyogranulomatous pneumonia. The nodular densities are Rhodococcus abscesses. Pneumonia from the other diseases in the answer choices might have an alveolar pattern on thoracic radiographs but would not be likely to have nodules. Pneumocystis is an opportunistic pathogen that can infect foals that are immunocompromised and cause interstitial pneumonia.

Question

You are evaluating a 4 year old Thoroughbred for intermittent epistaxis. Upon examination of skull radiographs (see image), what is the most likely diagnosis for the epistaxis?



- Nasal adenocarcinoma
- Ethmoid hematoma
- Exercise induced pulmonary hemorrhage
- Guttural pouch mycosis

Explanation - The most likely cause of the epistaxis based on the radiographs is ethmoid hematoma. These lesions are angiomatous masses that originate from the mucosal lining of the ethmoid conchae or walls of the maxillary or frontal sinus. Guttural pouch mycosis also can result in epistaxis but typically has no radiographic changes. Although horses can get tumors in the nasal passages, this is relatively rare. Exercise-induced pulmonary hemorrhage also can result in epistaxis, but the blood originates from the lungs. In the radiograph provided, notice the smooth, well-defined soft tissue mass in the sinus region of this horse. No osseous changes or fluid lines are apparent in this radiograph. In this particular case (ethmoid hematoma), the soft tissue mass is actually dorsal to the ethmoid turbinates (ethmoids are normal appearance in this case). Upon surgical removal, a definitive diagnosis of ethmoid hematoma was confirmed.

Question

What is the treatment of choice for a Rhodococcus equi infection in a foal?

- Erythromycin and rifampin
- Penicillin and metronidazole
- Enrofloxacin and ampicillin
- Trimethoprim-sulfa and metronidazole

Explanation - The correct answer is Erythromycin and rifampin. This is a must-know fact, as this disease is very commonly encountered. Treatment is usually for about 2 months but should be based on resolution of clinical signs, radiographic signs, and bloodwork. More recently, newer macrolide antimicrobials such as Clarithromycin and Azithromycin have been used in foals with R. equi pneumonia. One clinical study demonstrated better outcome with Clarithromycin and rifampin; additionally, Clarithromycin is typically administered twice daily, whereas erythromycin may have to be administered four times a day.

Question

Which of these viruses are normally found in the upper respiratory tract of the horse?

- Equine viral arteritis virus
- Equine herpesvirus
- Equine adenovirus
- Equine influenza

Explanation - The correct answer is equine adenovirus. Adenovirus is normal in the upper respiratory tract but can cause a lower respiratory tract infection in immunocompromised individuals, particularly foals with FPT or CID. In fact, adenovirus is the most common cause of death in foals with those two conditions, leading to an often fatal pneumonia.

Question

How is equine herpesvirus 1 transmitted?

- Venereally
- Inhalation
- Fecal-oral
- Blood-sucking arthropods

Explanation - The correct answer is inhalation. Equine herpesvirus-1 or equine viral rhinopneumonitis is a rapidly-spreading disease that is spread by inhalation directly or indirectly from infected nasal discharge, aborted fetuses or placenta.

- EHV-3, the cause of equine coital exanthema is spread venereally.
- Both EHV-1 and EHV-4 are a cause of rhinopneumonitis, but they are very important because they also result in abortions.
- EHV-1 is also associated with myeloencephalitis and has resulted in various outbreaks in the U.S. and abroad. EHV-1 is the main cause of paresis, abortions, and neonatal foal deaths, according to a recent article by Patel and Heldens.

Question

In the horse, what is the most important muscle or muscle group required for the inspiratory phase of the respiratory cycle?

- Internal intercostals
- External intercostals
- Abdominal muscles
- Diaphragm

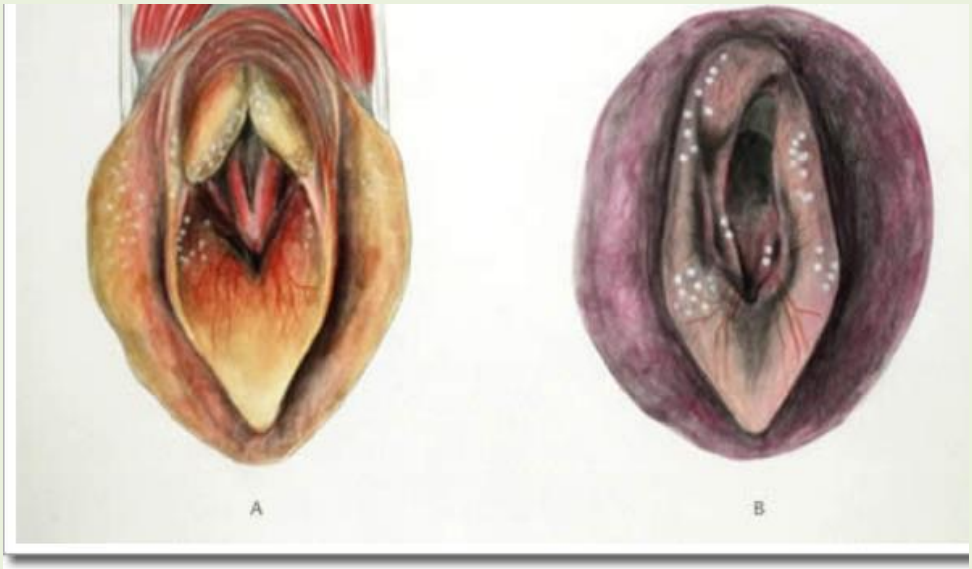
Explanation - The correct answer is the diaphragm. Contraction of the diaphragm pushes the abdominal contents back, increasing the length of the thoracic cavity, and pulls the ribs abaxially. The external intercostal muscles assist in pulling the ribs abaxially. This ends up producing subatmospheric intrathoracic pressures and allows inspiration to occur. Contraction of the internal intercostal muscles and the muscles of the abdominal wall decrease lung volume and compress the chest wall. The diaphragm is important in this process because diseases altering innervation or strength of the diaphragm (such as botulism or phrenic nerve damage) or diseases preventing expansion of the diaphragm into the abdomen (such as large colon torsion) are important causes of respiratory distress and potentially hypoxemia and death.

Question

A 7 year old male horse presents for exercise intolerance and noisy breathing. On your exam, you note mild inspiratory dyspnea with an audible whistling sound on inspiration. What is the most likely diagnosis?

- Sinusitis
- Laryngeal hemiplegia
- Asthma
- Intrathoracic large airway obstruction

Explanation - The correct answer is laryngeal hemiplegia. In this condition, the recurrent laryngeal nerve is damaged. Interestingly, the left side is almost always the side that is affected. An actual cause is usually not found, although direct trauma and certain toxins can cause laryngeal hemiplegia. It is thought to be a hereditary disorder. An intrathoracic large airway obstruction and asthma would both cause more expiratory dyspnea. Sinusitis may cause nasal discharge but is not likely to cause the signs this horse is showing.

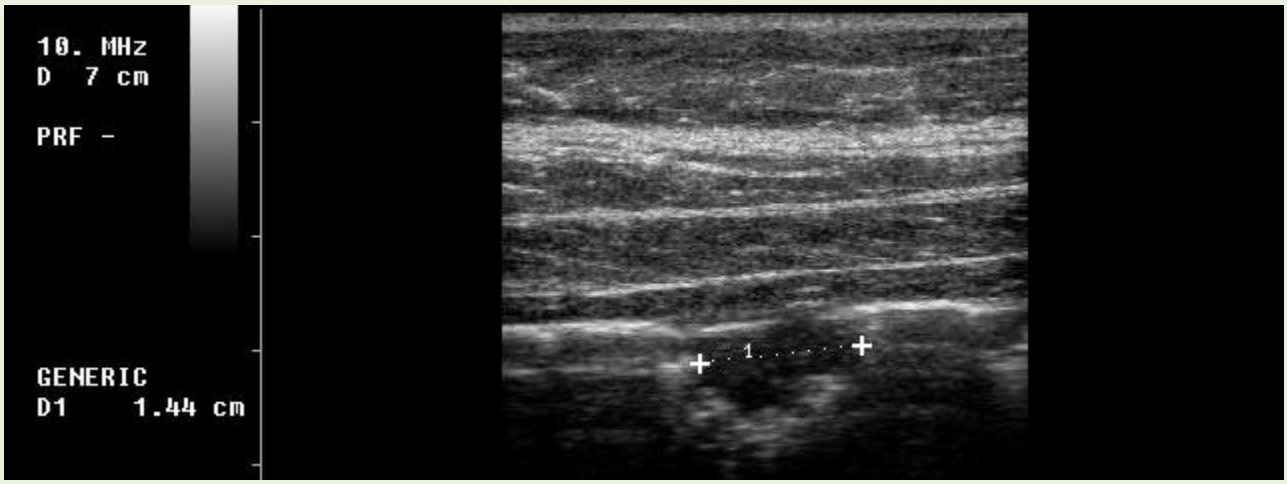


RESPIRATORY DISEASES OF HORSES
A) Normal image of the larynx, horse. B) Laryngeal hemiplegia, horse. Illustration by

---

Question

You are examining a 4 month old Thoroughbred colt with a 2 week history of weight loss, fever, and increased respiratory rate. You suspect pneumonia and notice the pictured lesion on thoracic ultrasonography. What is the most likely cause?



- Equine Herpes Virus pneumonia
- Streptococcus zooepidemicus pneumonia
- E. coli pneumonia
- Rhodococcus equi pneumonia

Explanation - R. equi is the most likely cause resulting in pulmonary abscess formation that may be noticed on thoracic ultrasound. In the ultrasound image, you should note the capsular structure with an anechoic

center which represents a fluid-filled abscess. R. equi is typically observed in older foals (2-6 months age) and demonstrates a slow insidious onset characterized by some or all the following findings: weight loss, fever, cough, nasal discharge, increased respiratory effort, and ill-thrift. Ultrasonography of the chest can provide a quick screening test for foals with R. equi pneumonia. All the other pathogens can cause pneumonia but are not classically associated with abscess formation.

Question

A 3 month old filly presents with a non-painful soft swelling in the right parotid region. She is very bright and alert and has a normal physical examination with the exception of a slightly stertorous breathing. What is the most likely diagnosis?

- Guttural pouch mycosis
- Streptococcus equi ssp. equi
- Ruptured longus capitis
- Guttural pouch tympany

Explanation - The correct answer is guttural pouch tympany. Guttural pouch tympany is a condition where the pouch becomes distended with air. It is thought to be due to a defect in the Eustachian tube or pharyngeal tissues. It leads to a characteristic non-painful, air-filled swelling and is treated by fenestrating the membrane between the normal and affected pouch.

In an animal this young, guttural pouch mycosis is unlikely, and the most common clinical sign of mycosis is epistaxis or dysphagia.

A ruptured longus capitis occurs from trauma and causes severe hemorrhage from the guttural pouch rather than the swelling described.

Streptococcus equi ssp. equi usually affects animals of 1 year of age or older, and usually causes swelling of lymph nodes. It can lead to guttural pouch empyema, but that is less likely given the signalment and presentation of this animal.

Question

Which of the following is the most common etiologic agent causing pneumonia in foals?

- Streptococcus spp
- Actinobacillus equuli
- Bordetella bronchiseptica
- Mycoplasma spp.

Explanation - The most correct answer is Streptococcus spp. Streptococcus is a common cause of pneumonia in both foals and in adult horses; however, polymicrobial infections are also common. Other common bacterial isolates associated with pneumonia include E. coli, Klebsiella sp, and various anaerobic bacteria. Rhodococcus (Corynebacterium) equi is also a common cause of pneumonia in foals 2-6 months of age. Actinobacillus can be associated with pneumonia, but the other two answers are not commonly isolated from equine pneumonia.

Question

Guttural pouch infections in the horse may result in pharyngeal paresis and food may reflux from the nose because:

- The soft palate no longer seals normally against the roof of the nasopharynx
- The tongue fails to engage the hard palate.
- The upper esophageal sphincter remains open.
- The epiglottis does not close normally against the rima glottidis.
- The arytenoid cartilages fail to seal the glottis.

Explanation - In normal swallowing, the soft palate moves dorsally to contact the roof of the nasopharynx and occlude the nasal passages such that food cannot reflux. This reflex is lost when cranial nerves 9 through 12 are inflamed or damaged in the guttural pouch due to infection. Mycotic infection is most frequently the cause.

All of the other answers except for the choice about the upper esophageal sphincter are also things that happen with pharyngeal paresis, but they are not responsible for feed refluxing from the nose. The epiglottis and arytenoids abnormalities result in coughing and aspiration of food into the larynx. Tongue problems result in food being dropped from the mouth during chewing and/or difficulty moving the food bolus to the pharynx for swallowing. If the upper esophageal sphincter remains open, there would be few clinical signs; that alone would not result in food refluxing from the nose.

Question

You examine a 2 year old horse with the complaint of bilateral nasal discharge and lethargy for about a week. The horse has a temperature of 102F, HR 40, and RR 25. The nasal discharge is non-odorous and contains multiple bacteria and neutrophils. The lateral throat area is swollen and tender on palpation. Lateral radiographs reveal fluid lines in the area of the guttural pouches. You submit some of the liquid pus for culture. What treatment is now most indicated?

- IM tetracycline daily for 2 weeks
- Immediate surgical drainage
- Systemic treatment with antifungal drugs for 4 weeks
- Daily catheterization and lavage of the pouches
- Systemic erythromycin for one month

Explanation – The correct answer is Daily catheterization and lavage of the pouches. Irrigation should use saline or saline plus an appropriate and non-irritating antimicrobial drug. Systemic antimicrobial drugs are also used, but the hallmark of successful therapy is lavage and drainage. For inspissated pus or refractory cases, surgical drainage may be necessary.

Question

You are called to a horse ranch that has an ongoing problem controlling infection and transmission of Streptococcal infections (Streptococcus equi subsp. equi) among its horses. You attempt to identify carriers by collecting wash samples from the guttural pouch since this is the most common place that horses harbor the organism. On endoscopy, you detect several hard, smooth, stone-like structures within the guttural pouch. What are these and what is their clinical significance?

- These are fungal granulomas and are an indicator of guttural pouch mycosis

- These are calcium carbonate gutturoliths and are an insignificant finding
- These are chondroids and are a source of persistent bacterial shedding
- These are inhaled foreign bodies and should be removed
- These are osteoids which are bony proliferations due to chronic osteomyelitis

Explanation - These objects are chondroids which are hardened pus filled concretions with bacteria. They most commonly occur when horses develop guttural pouch empyema which is an accumulation of purulent exudate in the guttural pouch due to mucosal infection or drainage from the retropharyngeal lymph nodes from Streptococcus equi subsp. equi (Strangles). The persistence of pus provides a refuge for the bacteria and allows for continued bacterial shedding. When exudate persists, it can become increasingly dense, forming solidified concretions that are difficult to extract and serve as a source for continued prolonged shedding of the organism.

To reduce shedding and transmission, these chondroids should be removed and the guttural pouch should be flushed and infused with 5 million units of penicillin G in 3% gelatin.

In addition, these horses should be treated with penicillin G intramuscularly for 7 days, isolated for 30 days, and then retested with 3 consecutive series of nasopharyngeal swabs and culture. Animals that remain positive should go through a repeat treatment and culture cycle.

Question

You suspect that an 18 year old Quarter Horse mare has recurrent airway obstruction (RAO; also known as chronic obstructive pulmonary disease) based on clinical signs of increased respiratory rate and effort, expiratory wheezes on auscultation, and the age of the horse. What cytologic finding of bronchoalveolar lavage (BAL) fluid would be supportive of RAO?

- Eosinophilic inflammation
- Neutrophilic inflammation
- Mixed inflammatory response (neutrophils, macrophages, and eosinophils)
- Mononuclear inflammation

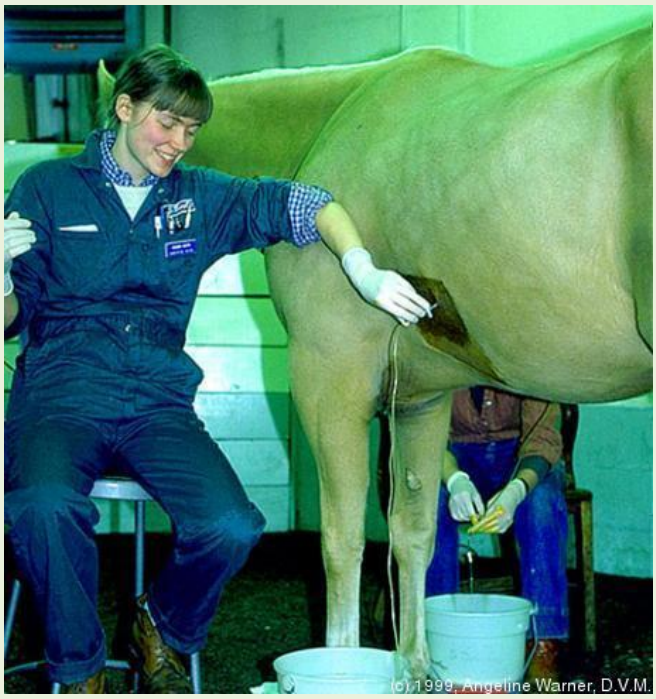
Explanation - In health, BAL fluid primarily consists of macrophages. However, in RAO, **neutrophils** are the predominant cellular finding. RAO typically affects older horses and is a response to environmental allergens. The classic case is the horse that is stalled in the winter and possibly housed in the vicinity of the hay storage. When the horse is exposed to hay allergens (via inhalation), bronchoconstriction and neutrophilic inflammation occur resulting in clinical signs.

Question

You suspect pleuropneumonia with pleural effusion in a horse. What is the proper site for thoracocentesis for pleural effusion removal in the horse?

- 7th rib space at costochondral junction
- 10th rib space at costochondral junction
- 4th rib space at costochondral junction
- 13th rib space at costochondral junction
- 10th rib space in the dorsal third of the chest

Explanation - Thoracocentesis can be performed at different locations; however, the 7th rib space at the level of the costochondral junction is the most appropriate answer available. The 4th rib space is near the heart, whereas the 10th or 13th rib space involves the caudal aspect of the thorax. This 7th rib space is a good choice because it is one of the more dependant regions where fluid will tend to accumulate; it is also caudal to where the heart should sit and well cranial to the diaphragm. When available, ultrasound guidance should be used to guide placement.



Thoracocentesis, a surgical puncture of the chest wall into the pleural cavity for aspiration of fluids, also called pleurocentesis.

Thoracocentesis is a procedure which has both diagnostic and therapeutic value.

When the findings from either thoracic auscultation or percussion suggest a pleural effusion, thoracocentesis can both confirm its presence and provide a specimen for examination.

Analysis of the pleural fluid may in turn help you to determine the underlying disease process and develop a therapeutic plan.

Drainage of pleural effusion via thoracocentesis is beneficial in removing large volumes of fluid from the thorax.

Question

A Thoroughbred racehorse presents to you for having poor performance, stopping at the ends of races, and having labored breathing. After races, the horse swallows excessively and will sometimes cough. What is your most likely diagnosis?

- Exercise-induced pulmonary hemorrhage

- Congestive heart failure
- Dynamic airway collapse
- Large airway obstruction

Explanation - The correct answer is exercise-induced pulmonary hemorrhage. This has multiple other names, and horses with this condition are sometimes referred to as bleeders or as bobbling, chocking, or gurgling. It is thought to be extremely common in **Thoroughbreds**. In this condition, following exercise at speed and large efforts from the lungs, pulmonary damage occurs and bleeding starts, usually in the caudal dorsal lung lobes. Common clinical signs are excessive swallowing after exercise because the horse is swallowing blood that was brought up. They may also cough to clear blood from their airways. Epistaxis is actually only seen in about **10%** of horses with exercise induced pulmonary hemorrhage. The other options in this question such as airway disease and heart failure would not be consistent with this horse's excessive swallowing after racing.

Question

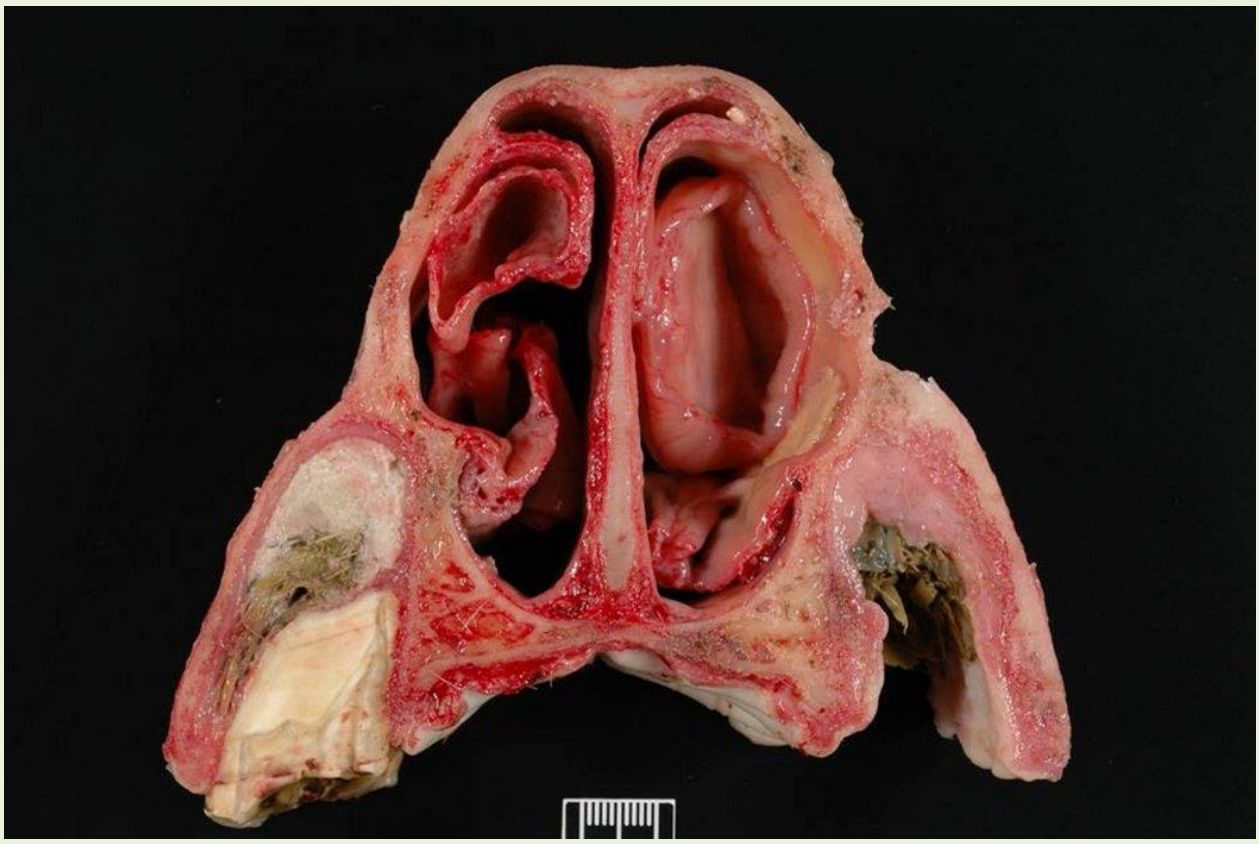
What diagnostic technique would be most useful for diagnosing a Dictyocaulus arnfeldi infection in a donkey?

- Fecal flotation
- Fecal sedimentation
- Fecal smear
- Baermann

Explanation - The correct answer is Baermann. Dictyocaulus is the lungworm of horses/donkeys. The life cycle of the worm is that an infective larva is ingested and migrates through the mesenteric lymph nodes through lymphatics to the lung where it develops into an adult, producing eggs that are coughed up, swallowed, and passed in the feces. 1st stage larvae hatch in the feces and are most likely to be detected with a Baermann. Other useful diagnostic techniques include a transtracheal wash, which may show eosinophils and possibly parasites, ova, or larvae. It is rare for horses to have patent infections. You will observe them more often in foals than in adult horses. Donkeys are considered the reservoir.

Question

What is the most common cause of maxillary sinusitis in a horse, as seen in the necropsy image below?



- Guttural pouch mycosis
- Tooth root abscess
- Dentigerous cyst
- Brachygnathia
- Foreign body

Explanation - The correct answer is tooth root abscess. Commonly the first molar teeth are involved. Clinical signs include weight loss, quidding (dropping half chewed feed), halitosis, swelling, and unilateral purulent nasal discharge.

Question

A 4 year old horse presents to you with a mucopurulent nasal discharge, lethargy, and depression. On physical exam, the horse has a temperature of 103.7F and has markedly enlarged mandibular and retropharyngeal lymph nodes. You suspect that the horse has strangles. What would you expect to see if you aspirated one of the enlarged lymph nodes?

- Purulent inflammation and gram positive cocci with large capsules
- Granulomatous inflammation and gram negative cocci
- Fungal hyphae and granulomatous inflammation

- Reactive lymphocytes and macrophages with no bacteria
- Purulent inflammation and gram negative rods with large capsules

Explanation - The correct answer is purulent inflammation and gram positive cocci with large capsules. The causative agent of strangles is streptococcus equi ssp. equi which is a gram positive cocci with a large capsule. It causes suppurative abscessation and enlargement of the mandibular and retropharyngeal lymph nodes.

Question

Which of these is not indicated as the initial treatment of a suspected streptococcus equi ssp. equi infection, causing mandibular and retropharyngeal lymph node abscessation in a 2 year old horse?

- Isolating the horse
- Systemic penicillin
- Aspirating the lymph nodes for culture and cytology
- Lancing the abscess ventrally

Explanation - The correct answer is systemic penicillin. Streptococcus equi ssp. equi is the agent causing strangles in horses. When they have lymph node abscessation, antibiotics are contraindicated because they will prolong the course of the disease but will not eliminate it. Because this disease is spread by direct contact, isolation of the horse is important. To obtain a definitive diagnosis, the lymph nodes could be aspirated. The treatment is to lance abscesses ventrally and dispose of all the material from the abscess to prevent spread of the organism.

Question

What is the treatment for persistent epistaxis from guttural pouch mycosis?

- Ligation of the external jugular vein
- Systemic itraconazole
- Ligation of the external carotid artery
- Ligation of the internal carotid artery

Explanation - The correct answer is ligation of the internal carotid artery. This closes off the artery over the guttural pouch, which has been destroyed by the fungal infection. Systemic itraconazole will not stop the bleeding.

Question

A 4 year old mare has bilateral swelling and drainage of the mandibular lymph nodes. Rectal temperature is 101.8F. Which of the following is the most appropriate plan for this horse?

- Administer corticosteroids
- Administer penicillin
- Inform the state veterinarian
- Culture the discharge for bacteria

Explanation - The correct answer is to culture the discharge for bacteria. The most likely diagnosis for this horse is equine strangles. Strangles must commonly affects younger horses (<5 years of age), but can cause disease in any age horse. The etiologic agent of this disease is Streptococcus equi subsp. equi. The diagnostic test of choice to confirm this is bacterial culture. While awaiting culture results, the horse should be separated from any other horses, as strangles is highly contagious to other horses. Antibiotic therapy is controversial and thought to lengthen the course of disease rather than shorten it when given at this stage; also, it may possibly interfere with the natural immunity acquired from natural infection. This is not a reportable disease.

Question

You are examining a 3 year old Thoroughbred gelding that just completed a race and notice discharge from the nostrils (see image). What would be an appropriate treatment for this horse prior to the next race?

- Vasopressin
- Whole blood transfusion
- Furosemide
- Plasma transfusion to replace clotting factors
- Vitamin K

Explanation - In this instance, the discharge is blood, with the most likely diagnosis being exercise-induced pulmonary hemorrhage (EIPH). One of the most commonly administered medications for EIPH is furosemide, which seems to decrease the incidence or lessen the severity of bleeding. The exact mechanism by which this occurs is not completely known but may be associated with reduced pulmonary capillary pressure.

Question

Many horses in a large group develop a rapid-onset high fever, weakness, depression, and cough. What step is most likely to lead you to a definitive diagnosis?

- Take thoracic radiographs of several affected horses
- Perform serologic testing for antibodies to common respiratory pathogens
- Perform a transtracheal wash for bacterial culture
- Take nasopharyngeal swabs for viral isolation
- Euthanize several affected horses and perform gross necropsies

Explanation - The correct answer is to acquire nasopharyngeal swab for viral isolation. Given the history of a rapidly-spreading infection with fever and cough, the most likely differential is equine influenza. This is caused by an orthomyxovirus. Other less likely rule-outs include equine viral rhinopneumonitis and equine viral arteritis. The way to definitively diagnose this is with viral isolation; a nasopharyngeal swab is the best sample. Growth in a bacterial culture would be more likely to indicate a secondary infection than a primary pathogen. Serology could be useful, but because influenza is so ubiquitous, paired titers are really needed to yield a diagnosis. Gross necropsy findings with influenza are fairly minimal and variable. Thoracic radiographs would not give you a diagnosis.

Question

Which of these recommendations is appropriate for a horse that has chronic obstructive pulmonary disease?

- Treat daily with atropine
- Feed a pelleted ration rather than hay
- Treat with broad spectrum antibiotics
- Maintain the horse in a stable whenever possible

Explanation - The correct answer is to feed pelleted ration rather than hay. Environmental factors and dust are thought to play a major role in the pathogenesis of COPD. An alternative to feeding pellets is to soak hay prior to feeding to reduce the dust taken in when eating. Stabled horses are much more likely to develop signs. Atropine can be given to bronchodilate in emergencies for acute attacks but should not be given routinely, as it can predispose to development of colic. Antibiotics would not be an effective recommendation because the disease is not infectious (there is no bacterial component to treat in most cases).

Question

A 9 year old Thoroughbred mare presents for intermittent left-sided epistaxis over several months. There is no history of trauma. The horse has mildly increased respiratory effort on your physical exam. Which of these is the most likely cause of recurrent, intermittent, unilateral epistaxis in this animal?

- Exercise induced pulmonary hemorrhage
- Purpura hemorrhagica
- Warfarin toxicity
- Ethmoid hematoma

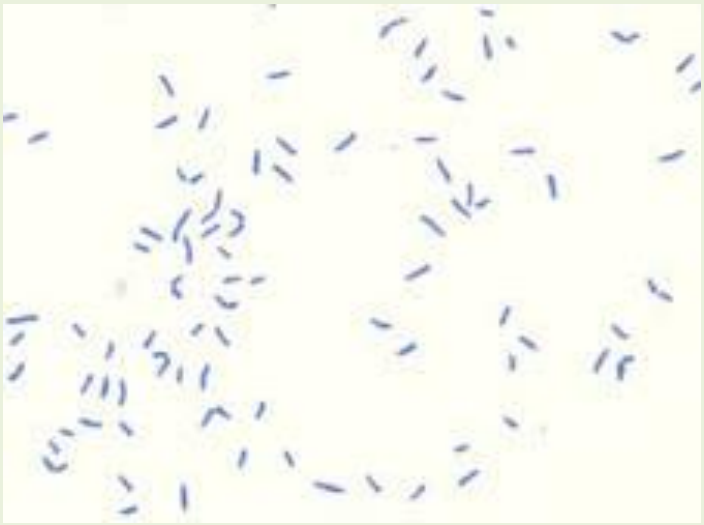
Explanation - The correct answer is ethmoid hematoma. An ethmoid hematoma is a progressive and locally destructive mass that resembles a tumor but is not truly neoplastic. The most common clinical sign is mild, persistent, spontaneous, intermittent epistaxis that can be unilateral or bilateral. Warfarin is not as likely in this horse due to the recurrent nature of the condition and the fact that it is unilateral. Exercise-induced pulmonary hemorrhage actually causes epistaxis only about 10% of the time. Also, since the bleeding is pulmonary in origin, the epistaxis would likely be bilateral. Epistaxis with this condition also occurs immediately after exercise, which was not reported in this horse. Purpura hemorrhagica is a vasculitis that results from a type III immune complex hypersensitivity after a streptococcus equi infection. This leads to vasculitis, and the main clinical signs are petechia and ecchymoses of mucous membranes.

Question

A 3 month old foal presents to you with a cough. On your exam, you note that the horse has a respiratory rate of 50, temperature of 103, and has wheezes on auscultation. You also note abdominal tucking on inspiration. You perform a transtracheal wash and find gram positive pleomorphic rods on cytology. What is your diagnosis?

- Streptococcus equi ssp. equi
- Rhodococcus (Corynebacterium) equi
- Equine influenza
- Streptococcus equi ssp. zooepidemicus

Explanation - The correct answer is Rhodococcus (Corynebacterium) equi. The signalment and clinical signs are most consistent with Rhodococcus equi infection. The pleomorphic gram positive rods on cytology make this clearly the best choice. The pleomorphic rods of Rhodococcus are often said to look like Chinese letters, so keep this in mind if you are shown cytology on the exam. Another helpful diagnostic tool is the presence of single or multiple abscesses within the lung fields observed via thoracic radiography or ultrasonography.



Question

What infectious agent is usually involved in guttural pouch mycosis?

- Cryptococcus
- Blastomyces
- Aspergillus
- Streptococcus equi ssp. equi
- Candida

Explanation - The correct answer is Aspergillus. Specifically, Aspergillus nidulans is the primary agent involved in guttural pouch mycosis, although other agents can sometimes be involved. Cranial nerves 7, 9, 10, 11, & 12 all cross the medial pouch as well as the sympathetic trunk and internal carotid artery. The external carotid artery crosses the lateral pouch. Therefore, other signs that can be seen include dysphagia and Horner's syndrome.

Vestibular signs do not occur because cranial nerve 8 does not cross the guttural pouch. Facial rubbing and sneezing also do not generally occur with guttural pouch mycosis. Because of the close proximity to major arteries, severe hemorrhage can occur if the mycosis invades the vasculature within the guttural pouch.

Question

Which of the following treatments is the least effective in the management of Recurrent Airway Obstruction (RAO; also known as chronic obstructive pulmonary disease) in a horse?

- Flunixin meglumine
- Corticosteroids
- Environmental changes

- Clenbuterol

Explanation - While flunixin (Banamine) is a common non-steroidal anti-inflammatory drug used in horses, it does not impart great therapeutic benefits in the horse with RAO. RAO is characterized by bronchoconstriction and accumulation of mucus/neutrophils. Clenbuterol is a Beta agonist that causes bronchodilation, while corticosteroids are potent anti-inflammatory medications that can reduce mucus and neutrophil accumulation. Environmental changes, such as placing the horse at pasture, feeding hay that has been soaked in water, and trying to reduce exposure to inhaled allergens are also part of the treatment protocol for a horse with RAO.

Question

You are called to a horse ranch that has an ongoing problem controlling infection and transmission of Streptococcal infections (Streptococcus equi subsp. equi) among its horses. You attempt to identify carriers by collecting wash samples from the guttural pouch since this is the most common place that horses harbor the organism. On endoscopy, you detect several hard, smooth, stone-like structures within the guttural pouch. Which of the following is the most important intervention?

- No action is needed
- Initiate a 1-month course of intramuscular penicillin G
- Initiate a 1-month course of oral itraconazole
- Remove the objects and thoroughly flush the guttural pouches

Explanation - These objects are chondroids which are hardened pus filled concretions with bacteria. They most commonly occur when horses develop guttural pouch empyema which is an accumulation of purulent exudate in the guttural pouch due to mucosal infection or drainage from the retropharyngeal lymph nodes from Streptococcus equi subsp. equi (Strangles). The persistence of pus provides a refuge for the bacteria and allows for continued bacterial shedding. When exudate persists, it can become increasingly dense, forming solidified concretions that are difficult to extract and serve as a source for continued prolonged shedding of the organism.

To reduce shedding and transmission, these chondroids should be removed and the guttural pouch should be flushed and infused with 5 million units of penicillin G in 3% gelatin. Chondroids can be removed surgically or via endoscopic basket removal.

In addition, these horses should be treated with penicillin G intramuscularly for 7 days, isolated for 30 days, and then retested with 3 consecutive series of nasopharyngeal swabs and culture. Animals that remain positive should go through a repeat treatment and culture cycle.

S. equi is not a reportable disease in all states.

Question

Purpura hemorrhagica is an immune complex disease of horses that leads to urticaria, edema, petechia, ecchymoses, and vasculitis. What disease is it usually secondary to?

- Streptococcus equi ssp. equi
- Streptococcus equi ssp. zooepidemicus
- Equine herpesvirus
- Rhodococcus equi

Explanation - The correct answer is Streptococcus equi ssp. equi. The exact reason why some horses develop purpura is unknown, but this is a relevant complication of equine strangles. Purpura hemorrhagica occurs weeks after infection or can occur after a bacterin is given.

Question

What body systems are primarily affected by equine herpesvirus?

- Respiratory and reproductive
- Respiratory and integument
- Integument and reproductive
- Gastrointestinal and central nervous system
- Gastrointestinal and reproductive

Explanation - The correct answer is respiratory and reproductive. The main signs seen with equine herpesvirus (EHV-1) or equine viral rhinopneumonitis are copious nasal discharge in foals and abortion in mares. It can also cause central nervous system signs and occasionally can cause neonatal death from pneumonia. The nasal discharge in foals is sometimes referred to as "Snots" in horses and may be serous or purulent if there is secondary bacterial infection.

Question

You are called out to a horse farm to look into a recent storm of abortions. You find out that about 4 months ago, many of the foals developed copious nasal discharge. This was not treated, and the foals recovered over several weeks. The abortions that are currently occurring are in mares that are in their last trimester. What is your diagnosis?

- Equine influenza
- Equine viral arteritis virus
- Equine herpesvirus
- Equine adenovirus

Explanation - The correct answer is equine herpesvirus. The key to answering this question is in the time frame. The foals developing clinical signs of herpesvirus infection several months prior to an abortion storm is classic for this virus. The mares are typically asymptomatic initially and then abort. It causes abortions in horses 7-11 months pregnant. Equine influenza and adenovirus do not cause abortions although they do cause respiratory signs. Equine viral arteritis is the second best choice, but it generally causes more mild respiratory signs and abortions during various stages of pregnancy. There also would not be the same lag period from when the foals got sick until when the mares started aborting.

Question

A 4-year old Thoroughbred race horse presents for further evaluation one day after a race. The owner was instructed by the trainer to inform you that blood was noticed on the nostrils immediately after racing. The horse was previously healthy and although there are rats in the barn there, is no documented exposure to rodenticides. Which of the following is the best diagnostic test for diagnosing the most likely condition?

- Buccal mucosal bleeding time (BMBT)
- Prothrombin time (PT)
- Proteins induced by vitamin K antagonism/absence (PIVKA)
- Bronchoscopy

Explanation - This horse is most likely afflicted with exercised induced pulmonary hemorrhage (EIPH). The pathogenesis of this condition is not entirely understood, but the condition is most commonly seen in racing horses. Bleeding may not always be evident and clinical signs include labored breathing, loss of speed during a race, and poor performance. Bronchoscopy of the airway to visualize evidence of hemorrhage is the best diagnostic test in this list of possible answers. Cytologic examination of a bronchoalveolar lavage for evidence of hemorrhage is also another way to diagnose the condition.

A PIVKA test is used in small animals to help diagnose exposure to rodenticides. A buccal mucosal bleeding test will test platelet function. Prothrombin time evaluates the extrinsic and common pathways of the coagulation cascade. Based on the signalment and history these are not tests you would consider first.

Question

Which of these vaccines is most likely to cause a local reaction at the injection site of a horse?

- Strangles
- Rabies
- Tetanus antitoxin
- Rhinopneumonitis

Explanation - Historically, an intramuscularly administered Strangles vaccine has been available and has been associated with soft tissue reaction. More recently, an intranasal vaccine has become available, which is associated with local protection without any injection reaction.

Question

You are urgently called out by a horse owner after his 2-year old mare reared over backwards and came up with epistaxis. By the time you reach the horse, she is a bit ataxic and has a slight left head tilt. Endoscopic examination confirms the origin of the epistaxis in the guttural pouch. What is your top differential diagnosis for this horse?

- Ruptured longus capitis
- Laceration of the maxillary vein
- Maxillary fracture
- Ethmoid hematoma

Explanation - The longus capitis and rectus capitis ventralis insert onto the basisphenoid and occipital bones. Rupture is usually caused by a rearing over backwards event. Epistaxis and varying degrees of brainstem signs are typically seen. Treatment for a ruptured longus capitis is primarily symptomatic and consists of stall rest and antibiotics to prevent secondary infection. Prognosis depends on the severity of neurological damage

Ethmoid hematoma is a progressive and locally destructive mass of the nasal passages or sinuses. This disease process could cause epistaxis but is not consistent with the recent trauma or the endoscopic findings in this case.

Maxillary fracture would likely result in additional clinical signs at the fracture site and would not explain the brainstem signs or endoscopic findings.

The maxillary vein is a branch of the external jugular vein. Traumatic laceration is very uncommon and depending on the location of the laceration, would cause external hemorrhage rather than epistaxis.
