Question

A Paint horse is found to be approximately 7% dehydrated after a several day trail ride. Assuming there are no other ongoing losses and the horse weighs 500kg how many liters of fluid will you need to give this horse over a 24 hour period to correct the deficit and account for maintenance requirements?

- 40L
- 65L
- 125L
- 75L

Explanation - To determine this answer you must figure out the deficit and calculate the horse's maintenance needs. The deficit is 35L (deficit x BW). Maintenance needs for a horse is approximately 60ml/kg/day (6 litres for 100 Kg). In this case (500 Kg Horse) 30 L. Adding the deficit and maintenance fluids together yields a total of 65 liters.

Question

A mare in the last trimester of pregnancy shows signs of colic. She has become anorexic and has been frequently attempting to urinate. Speculum exam is within normal limits. On rectal palpation, you note the broad ligament pulled tight over the uterus from right to left. What is your diagnosis?

- Ruptured prepubic tendon
- Normal parturition
- Uterine torsion
- Breech malpositioning of the fetus

Explanation - The correct answer is uterine torsion. These are the typical clinical signs seen in uterine torsions (colic and frequent urination in a late-term mare) and the key finding is the rectal palpation of the tight broad ligament coursing over the uterus. Speculum exam is not diagnostic in horses because torsions typically do not involve the cervix as they do in cows. Medical treatment may be attempted by placing the mare under short-acting anesthesia and rolling her (plank-in-the-flank), or surgical correction may be necessary. Video

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Question

A horse presents with urticaria, edema of the extremities, petechiation of the mucous membranes, and a stiff gait. On physical exam, you suspect the horse to have purpura hemorrhagica. Which of these abnormalities is associated with purpura hemorrhagica?

- Hypoproteinemia
- Prolonged PT and PTT
- Thrombocytopenia
- Anemia

Explanation - The correct answer is anemia. Purpura hemorrhagica is a possible sequela of streptococcus equi infection exposure or vaccination. It develops from a Type III hypersensitivity resulting in immune complex deposition in blood vessel walls and vasculitis. Common clinical signs are as described in the question. This is a nonthrombocytopenic purpura (most horses will have a normal platelet count). Common findings include anemia, hyperproteinemia, hyperfibrinogenemia, hyperglobulinemia, and neutrophilia.

Question

You are called one hot summer day to see a group of horses in New Mexico which are slobbering and not eating their hay. Three out of 20 horses seem to be visibly affected. On physical exam of the first one, you find fever of 104 F and obvious oral ulcers as shown in the image, mainly on the tongue. What is your tentative diagnosis?

- African Horse Sickness
- Glanders
- Vesicular stomatitis
- Foot-and-Mouth disease (FMD)
- Bovine papular stomatitis

Explanation - VS affects horses, cattle and pigs with similar clinical signs. It is a viral disease of high morbidity and low mortality that appears about every 7 to 10 years in the Southwestern United States. Yearly outbreaks occur in southern Mexico and northern South America. Black flies and midges appear to be the vectors. Affected premises should be quarantined.

Question

You are called out to a horse farm to look into a disease outbreak. Multiple horses are showing signs of fever, colic, and subcutaneous edema. You find 2 dead horses that do not show rigor mortis with unclotted blood exuding from their noses. Which of these is the LEAST appropriate diagnostic or therapeutic step to take next?

- Perform a field necropsy on one of the dead horses
- Look at a blood smear from one of the sick horses
- Administer penicillin to all the febrile horses
- Perform a CBC and Chemistry panel on one of the sick horses

Explanation - The answer is perform a field necropsy on one of the dead horses. While many of the signs are non-specific, the unclotted blood and lack of rigor mortis should raise your suspicion that you may be dealing with an anthrax outbreak. Performing a field necropsy would be dangerous to you and to the other horses and people in the area.

Question

You are out in the field and you notice a horse tilt his head up and curl back his lips in a manner that makes it appear to be "grimacing". You identify this as a flehmen response. What is thought to be happening when this response occurs?

- This is a sign of sexual interest or arousal and you need to be careful if the horse is nearby
- This is a pathognomonic sign of yellow star thistle toxicity
- This is a sign of colic
- This is a display of aggression or dominance that a horse will display when it detects the presence of other stallions
- Scents are moved to the vomeronasal organ

Explanation - The flehmen response, as described in the question, helps animals trap pheromone scents in the vomeronasal organs (VNOs) so they can be analyzed more closely. Pheromones are the chemical signals emanating from other animals.

When a horse draws in an organic odor, he curls up his lip to temporarily close the nasal passages and hold the particles inside. The upward head tilt seems to help the airborne molecules linger in the VNOs, which are located under the floor of the horse's nasal cavity.

While sex pheromones are the most common flehmen trigger, they are not the only ones, and the response itself does not indicate sexual interest.

Question

How long after parturition in the mare is a placenta considered to be retained?

- 20-30 minutes

- 24-36 hours
- 1-2 hours
- 3-6 hours
- 48 hours

Explanation - The correct answer is 3-6 hours, although controversy exists in the literature on the exact time-line in which fetal membranes are considered retained. The placenta of a horse should be expelled in the time frame between 30 minutes and 3 hours or else corrective measures should be taken, such as **oxytocin** administration to prevent metritis and infection from occurring. Retained placenta is a serious condition in mares and should be evaluated as soon as possible. Associated complications of retained placenta include metritis and laminitis. Unlike other species, the mare does not eat the placenta.

Question

A horse is referred to your practice for further evaluation and treatment of glomerulonephritis. Which of the following is not a treatment option?

- Long term furosemide administration
- Corticosteroids
- Plasma transfusion
- Low protein diet

Explanation - The correct answer is long term furosemide administration. Horses with glomerulonephritis are usually polyuric. Furosemide is only indicated for oliguric renal failure. The other choices are commonly used in the treatment and management of glomerulonephritis. A low protein diet will help decrease the amount of proteinuria and blood urea nitrogen circulating at any given time, therefore helping reduce the degree of azotemia.

Question

Repair of a pneumovagina in the mare involves which of the following?

- Placing horizontal sutures at the ventral aspect of the labia and decrease the weight of the mare
- Placing horizontal sutures at the ventral aspect of the labia and increase the weight of the mare
- Placing horizontal sutures at the dorsal aspect of the labia and decrease the weight of the mare
- Placing horizontal sutures at the dorsal aspect of the labia and increase the weight of the mare

Explanation - The correct answer is placing horizontal sutures at the dorsal aspect of the labia and increase the weight of the mare. The reasons lie in understanding why and how pneumovagina occurs.

Usually it is seen in **older, thin mares** due to abnormal perineal conformation. In these mares, the anus is pulled forward, which leads to tipping of the vulva dorsally, causing opening of the vagina. Therefore, in the surgical repair, it is the dorsal portion of the labia that is tipped cranially that needs to be sutured, and increasing the weight of the mare tends to realign the anatomy appropriately.

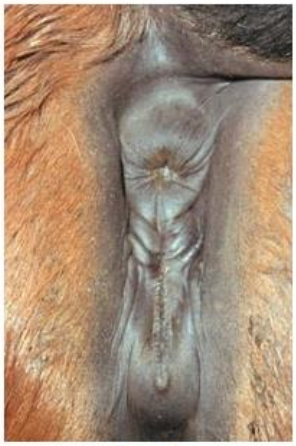


Figure 1:
Normal vulval conformation.

Figure 2:
Abnormal vulval conformation.

Figure 4:
Severely abnormal vulval conformation with "vulval shelf" formation.

Figure 10:
Infiltration of local anaesthetic.

Figure 11:
Removal of a very narrow strip of mucosa.

Figure 12:
The submucosal tissues are sutured togeth

Question

When evaluating passive transfer of maternal antibodies in a newborn foal using an ELISA, antibodies should be:

- 800 mg/dL
- < 400 mg/dL
- 400-600 mg/dL
- 600-800 mg/dL

Explanation - Foals are born immunocompetent but lack antibodies when born; therefore they must ingest maternal antibodies through colostrum. Veterinarians commonly evaluate passive transfer by performing **a semi-quantitative ELISA test**. For adequate passive transfer, antibodies should be greater than 800 mg/dL.

Question

Which of these tests is used to diagnose a Corynebacterium pseudotuberculosis infection with internal abscesses in horses?

- Coggin's test
- KOH test
- Hemagglutination inhibition test
- Zinc sulfate turbidity test

Explanation - The correct answer is hemaglutination inhibition test. Other clinicopathologic data that would support an internal abscess would include leukocytosis, hyperfibrinogenemia and hyperglobulinemia.
A KOH test is to look for dermatophytes.
The zinc sulfate turbidity test is for failure of passive transfer.
The Coggin's test is for equine infectious anemia.

Question

All aminoglycosides have the potential for causing tubular nephrosis. Which of the following aminoglycosides is most nephrotoxic to horses?

- Streptomycin
- Amikacin
- Neomycin
- Gentamicin

Explanation - The correct answer is neomycin. This is followed by gentamicin and then amikacin. Streptomycin is the least nephrotoxic aminoglycoside.

Question

A 23-year old Morgan horse presents to you for evaluation due to several changes that the owner has noticed in recent months. He reports that the horse has been drinking and urinating more frequently and seems to have lost muscle mass. He also reports excessive sweating and hair coat changes. Specifically he reports that the horse has developed a long curly hair coat that does not shed properly (see image). You recognize this array of clinical signs as being very consistent with a common clinical syndrome in older horses. Which of the following is the most appropriate treatment for this condition?

- Pergolide
- Glargine
- Dexamethasone
- Quinidine
- Levothyroxine

Explanation - This case describes the typical presentation of equine pituitary pars intermedia dysfunction (PPID), sometimes referred to as equine Cushing's disease. The disease is a progressive disorder of pituitary enlargement (adenoma). The condition usually affects horses greater than 15 years of age and may affect any breed but ponies and Morgan horses have increased incidence. The classic symptom which is highly suggestive of this condition is hirsutism which is the symptom of a long curly hair coat that does not shed properly. Other symptoms include polyuria, polydipsia, laminitis, lethargy, excessive sweating or lactation, decreased muscle mass, infertility, and susceptibility to infections such as tooth root abscesses.

Hirsutism as a clinical sign is the most sensitive indicator of PPID. Diagnosis of PPID by laboratory testing in horses with subtle signs can be challenging since no single test is absolutely sensitive and specific, but the most commonly used tests are the dexamethasone suppression test and the measurement of endogenous ACTH levels. Although the dexamethasone suppression test is thought to be the most reliable, there are concerns about seasonal hormonal fluctuations that can lead to false positives in the fall. In horses with laminitis, it may also be desirable to avoid administration of dexamethasone.

Treatment aims to decrease clinical signs and does not typically result in a cure or complete remission of all signs. Pergolide is generally considered the treatment of choice. Pergolide is a dopamine agonist that is

used to treat Parkinson's disease in humans. The drug acts to suppress pituitary hormone secretion. Older references will refer to the use of cyproheptadine which is a serotonin antagonist as a preferred treatment for PPID. There is also investigation that trilostane, a 3-beta hydroxysteroid dehydrogenase inhibitor may be useful in the management of PPID.

Question

You are presented with an 8-month old Quarter horse filly with a chronic history of urinary incontinence. The image provides one of the findings on physical examination. The remainder of the physical exam, along with a CBC and chemistry profile, is normal. What is the most likely cause of these signs in this filly?

- Ectopic ureter
- Equine protozoal myelitis (EPM)
- Equine herpes virus myeloencephalopathy
- Severe urinary tract infection

Explanation - Urine scalding, as pictured, along with the age and gender of this patient, would lead to a high suspicion of an ectopic ureter. While this is a comparatively rare problem, it is the most common congenital anomaly of the equine urinary tract. Nearly 90% of the cases reported are fillies, with the primary complaint of urinary incontinence and urine scalding (dermatitis). Surgical correction has been successful. The chronic history in a young animal makes primary urinary tract infection less likely.

Question

A 10-year old gelding presents for salivation and vesicular lesions on the tongue and on the inside of the mouth. A full physical exam shows that there are similar lesions on the feet of the horse as well. Which of the following is a possible diagnosis for this horse?

- Vesicular stomatitis

- Foot-and-mouth disease
- Swine vesicular disease
- Vesicular exanthema

Explanation - The correct answer is vesicular stomatitis. Vesicular stomatitis is characterized by vesicle lesions on the tongue, inside of the mouth, teats, and feet. Besides horses, cattle, sheep, goats, and pigs are susceptible to the disease. The disease is differentiated from the others listed because horses are not naturally susceptible to the other diseases. The absence of papules and pustules allows us to differentiate vesicular stomatitis from horsepox.

Question

What is the most frequently observed side effect associated with acepromazine use in horses?

- Seizures
- Paraphimosis
- Hypotension
- Arrhythmias

Explanation - The correct answer is hypotension. Acepromazine will reliably cause hypotension. Acepromazine may cause paraphimosis in male horses, but this is not very common. However, because of this, many veterinarians will not use acepromazine on stallions. Acepromazine actually has anti-arrhythmogenic properties. Acepromazine does reduce the seizure threshold, but seizures are not as common as hypotension.

Question

You are on a service trip in Africa to provide veterinary care to local horses. You examine a 4-year old horse with mucopurulent nasal discharge, lethargy, and depression. On physical exam, the horse has a temperature of 103.4F and has markedly enlarged mandibular lymph nodes. You are initially suspicious of Strangles but you should also be concerned about which exotic disease that can have a similar presentation?

- Rift Valley Fever
- Dourine
- Glanders
- African Horse Sickness
- Surra

Explanation - The horse's presentation is also consistent with the nasal form of glanders.

Glanders is a bacterial disease caused by Burkholderia mallei (previously known as Pseudomonas mallei). It is thought to be endemic in regions of the Middle East, Asia, Africa, and South America. In addition to horses, glanders can be seen in donkeys, mules, and small ruminants. Glanders is primarily a concern in

horses because they can be chronic or occult carriers that intermittently shed this deadly and potential zoonotic pathogen.

Burkholderia mallei causes 3 different forms of disease; nasal glanders, pulmonary glanders, and cutaneous glanders (also referred to as Farcy).

The nasal form presents with high fever, loss of appetite and labored breathing with cough. Viscous mucopurulent discharge or crusting may be present around the nares. There may be ulceration of the upper respiratory passages that resolve in the form of star-shaped cicatrices ("stellate scars"). Regional lymph nodes may be enlarged and indurated and may rupture or adhere to deeper tissues.

The pulmonary form often develops over several months, beginning as a fever with dyspnea and cough. Lung lesions commence as light colored nodules surrounded by hemorrhage or as diffuse pneumonia. The nodules may become caseous or calcified and discharge contents to the upper respiratory tract. Nodules may also be found in other organs.

The cutaneous form develops over several months, beginning with cough and dyspnea as well. Eventually, nodules develop in subcutaneous tissue along the course of the lymphatics of the legs, costal areas, and ventrum. They can rupture and excrete infectious purulent exudate. Infected lymphatics may form thickened cord-like lesions that sometimes coalesce into a string of beads appearance known as "farcy pipes". Nodular lesions of other organs may also be found.

Burkholderia mallei can be identified in smears made from fresh lesions as mainly extracellular straight Gram-negative rods with rounded ends. Several diagnostic tests exist including PCR, ELISA, and Western Blot but the two that you actually need to know about because they are used in international trade are complement fixation (CF) serology and the mallein test. The mallein test is considered the most reliable, sensitive, and specific test; it involves injection of mallein purified protein derivative intradermally into the lower eyelid. The test is read at 24 and 48 hours and a positive reaction is characterized by edematous swelling or purulent discharge.

Horses should not be treated; local authorities should be notified if a case is suspect and if disease is confirmed, horses must be humanely destroyed and affected caracasses should be burned and buried.

Dourine is a trypanosomal venereal disease. Surra is a trypanosomal disease causing primarily fever, weakness, and lethargy. Rift Valley Fever is a viral disease primarily of ruminants causing influenza-like signs and hepatic lesions. African Horse Sickness is a viral respiratory disease of horses but signs are primarily pulmonary whereas the horse in this case has nasal signs and mandibular lymph node enlargement.

Question

Which of the following stallions should definitely not be used for breeding?

- A stallion with 180 degree rotation of the testicle
- A stallion with previous infection with Taylorella equigenitalis
- A stallion with a previous infection with coital exanthema
- A stallion with a positive bacterial culture from a pre-ejaculate swab

Explanation - The correct answer is a stallion with a previous infection with Taylorella equigenitalis. This organism is thought to be eradicated in the United States but is the causative agent of **contagious equine metritis**, which can lead to infertility (there is usually no clinically apparent disease in the stallion). It is okay to breed a stallion with a history of coital exanthema (Equine herpesvirus-3) as long as all lesions are cleared. A 180-degree rotation of the testicle is common and of no clinical significance as is a positive bacterial culture from a pre-ejaculate swab; however, heavy growth of Pseudomonas or Klebsiella may make you think twice, as they can be associated with causing endometritis in mares.

Question

Chronic renal failure (CRF) in horses commonly results in clinical signs such as weight loss, inappetence, polydipsia and polyuria. Besides azotemia, what electrolyte changes would you likely see on serum biochemistry evaluation of a horse with CRF?

- Hypercalcemia, hypophosphatemia
- Hyperkalemia, hyperchloremia
- Hypernatremia, hypochloremia
- Hypercalcemia, hypernatremia

Explanation - Hypercalcemia and hypophosphatemia would be the best answer of those provided. The classic findings of renal failure include hyponatremia, hypochloremia, hyperkalemia, and azotemia. Somewhat **unique to the horse**, hypercalcemia is noted because of the high amounts of calcium present in the diet. Serum phosphorus levels may be low because of the high calcium.

Question

Alpha 2 receptor agonist drugs are routinely used for sedation of horses. Which of the following alpha 2 receptor agonists has the lowest receptor affinity and shortest duration of action?

- Xylazine
- Detomidine
- Medetomidine
- Romifidine

Explanation - The correct answer is xylazine. Xylazine has the lowest receptor affinity, duration of action, and has the largest dose requirement of the alpha 2 agonists. Sedative effects of xylazine last for about 20 minutes. Sedative effects of detomidine typically last approximately 90 minutes; however, peak sedation is achieved for 10-20 minutes. Romifidine is similar to detomidine; however, the side effects are supposed to be decreased.

Question

A Thoroughbred race horse has been moved from California to Florida in July and is experiencing poor performance, exercise intolerance and tachypnea. You observe the horse working out one hot afternoon

and see these signs, but you also note that the horse is not sweating. You check the rectal temperature and note that it is 104F. What is the diagnosis?

- Influenza
- Equine Cushing's
- Hypothyroidism
- Anhidrosis
- Diabetes insipidus

Explanation - Anhidrosis is the inability to sweat, which can be fatal if not addressed. The cause is unknown. It tends to occur in hot humid climates, and may occur in horses raised in the climate, or more commonly, horses brought into the climate. The most successful treatment is to move the horse back to a more favorable climate.

Question

Which of these drugs has the greatest potential for causing acute renal failure in the horse?

- Neomycin
- Diphenhydramine
- Oxytetracycline
- Dexamethasone
- Xylazine

Explanation - The correct answer is neomycin. Aminoglycosides are one of the most common causes of renal tubular nephrosis and acute renal failure. Of the aminoglycosides, neomycin is probably the most nephrotoxic, followed by gentamicin, amikacin, and streptomycin. The other big class of nephrotoxic drugs is non-steroidal anti-inflammatory drugs.

Question

You are examining a 14-year-old Saddlebred gelding with an acute onset (24 hours) history of profuse watery diarrhea. Your physical exam findings include a heart rate of 65 beats/min, respiratory rate of 28 breaths/min and a rectal temperature of 102.7F. The horse is lethargic and is not willing to eat. Based on this presentation, you decide to perform a venous blood gas analysis which yields the following results:
pH 7.29 (7.35-7.45)
PO2 60 mmHg (variable)
PCO2 32 mmHg (~40mmHg)
HCO3 16 mEq/L (24-30 mEq/L)
Ionized Ca++ - 1.7 mmol/L (1.4-1.8 mmol/L)

What is your interpretation of this venous blood gas analysis?

- The horse is hypoxemic

- The horse has a metabolic acidemia with respiratory compensation
- The horse has a respiratory acidemia with metabolic compensation
- The horse has a metabolic acidemia without respiratory compensation
- The horse has a metabolic acidemia without respiratory compensation

Explanation - You should really know approximate normal reference intervals for the test., pH = 7.35-7.45; PO2 is variable in venous blood; PCO2 = 40 mmHg, HCO3 = 24-30 mEq/L, iCa++ = 1.4-1.8 mmol/L. This is a general range, with each species having slight changes to this range.)

Explanation: The correct answer is metabolic acidemia with respiratory compensation. The pH is low which suggests acidemia, the HCO3 is low which suggests the cause of acidemia; the PCO2 is low and respiratory rate is high which suggests respiratory compensation. If you did not know the normal reference intervals and they were not provided, you should still be able to make an educated guess that a horse (or any other species) with notable diarrhea has a good chance of having a metabolic acidemia because of the loss of bicarbonate in the feces and the fact that the patient typically rehydrates by consuming electrolyte/bicarbonate-free water orally.

Question

It is winter, and you are called to examine a herd of camels that have developed a severe skin condition over the last 2 weeks. The farmer noticed that the camels were losing hair around their head and neck and has now spread down the entire body. On exam, some areas appear swollen and there is hairloss and wrinkling of the skin. The camels are rubbing up against each other and against fences and trees due to intense pruritus. You tell the farmer that the camels most likely have which condition?

- Selenium deficiency
- Sarcoptic mange
- Zinc deficiency
- Dermatophytosis

Explanation - Infection with Sarcoptes scabiei var. cameli is most likely and is the only type of mange to infect camels. It is most common in the winter when the camels huddle together for warmth, thus increasing direct contact with each other. The mange typically starts around the head and neck and then spreads to the rest of the body.

Question

Average gestation length in the mare is how long?

- 265 days
- 405 days
- 305 days
- 345 days

Explanation - The correct answer is 345 days, although gestational length can range from 330-360 days. It is good to have knowledge of previous gestational lengths because individual brood mares have the same/similar gestational lengths every year, allowing accurate estimate of foaling date. Additionally, this is important because many horse owners want mares to foal in mid-January for the reason that in racing, all horses have an artificial birthday on January 1st. In order to achieve this, it is recommended to breed in mid-February. Since the horse is seasonally polyestrous and would naturally start cycling in April or May, artificial lighting is often used starting in mid-December to promote estrus in mid-February.

Most foals are considered premature if born prior to 320 days and prolonged gestation is typically associated with greater than 365 days.

Question

What is the duration of a mare's estrous cycle?

- 19-26 days
- 41-52 days
- 27-37 days
- 9-15 days

Explanation - The correct answer is 19-26 days. Estrus in a mare can last 2-10 days but, on average, is 6 days long. The mare is a polyestrous animal from the beginning of spring through summer. The estrous cycle's duration lasts 19-26 days.

Question

What body systems are most affected in an anaphylactic reaction in a horse?

- Lungs and colon
- Kidney and colon
- Liver and lungs
- Heart and small intestine

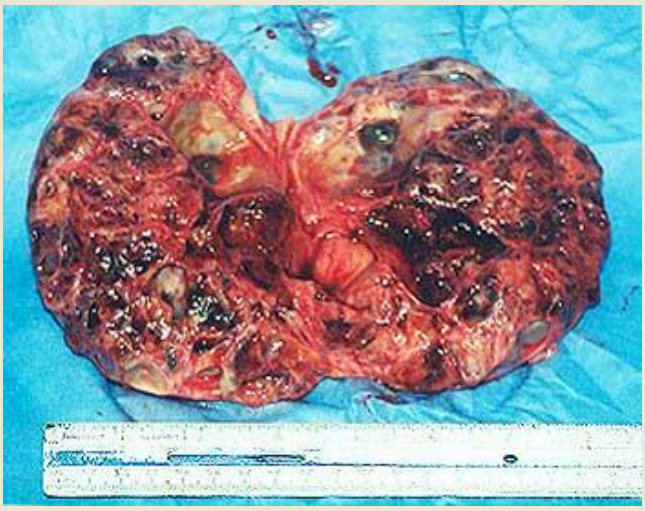
Explanation - The correct answer is lungs and colon. These are referred to sometimes as the shock organs in the horse. When a horse undergoes an anaphylactic reaction from an allergen or chemical stimulus, the primary signs will be respiratory and lower GI and will include **dyspnea** or severe respiratory distress and **diarrhea**. Other common signs include anxiety, tachycardia, piloerection, and sweating. Treatment of anaphylactic shock usually includes injection with some combination of epinephrine, corticosteroids, and an antihistamine.

Question

A 12-year old mare presents for infertility and abnormal sexual behavior. On rectal palpation, you feel a large multicystic ovary and the other ovary feels very small. What is the most likely diagnosis?

- Ovaritis
- Granulosa-thecal cell tumor
- Cystic ovarian follicles
- Ovarian hematoma

Explanation - The correct answer is granulosa-thecal cell tumor. The clinical signs and palpation findings are both consistent with this diagnosis. The other choices listed may create a palpable ovarian mass but would not cause atrophy of the contralateral ovary and should not cause infertility. Honeycomb appearance on U/S.



Question

Fistulous withers refers to inflammation of the _____.

- Nuchal ligament
- Supraspinous bursa
- Bicipital bursa
- Infraspinatus

Explanation - The correct answer is supraspinous bursa. This bursa is variable in size and location but is usually found between the second and fifth thoracic vertebrae and can extend ventrolaterally to the margin of the scapular cartilage. The etiology is thought to be infectious. Clinical signs are pain, heat, and swelling in the region of the bursa. After days to weeks, the bursa can rupture resulting in drainage of fluid. Brucella abortus has been identified in up to 80% of clinical cases by serology and culture. Treatment consists of flushing the fistula and appropriate antibiotics.

Question

What is the most common infectious cause of infertility in the United States in the horse?

- Streptococcus equi ssp. zooepidemicus
- Pseudomonas aeruginosa
- Taylorella equigenitalis
- Klebsiella pneumoniae

Explanation - The correct answer is Streptococcus equi ssp. zooepidemicus. This is a common inhabitant of the external genitalia of mares and stallions and causes disease when there is a predisposing factor such as immunosuppression, pneumovagina, or damage to the endometrium.

Taylorella equigenitalis is the causative agent of contagious equine metritis, which is rare in the United States. Klebsiella and Pseudomonas can both cause infertility but are considerably less common than Streptococcus zooepidemicus.

Question

A 26-year old horse presents for evaluation of increased thirst and urination. On exam, you note that the pony has a a long curly hair coat and you question the owner who reports that this hair coat has developed gradually over the past 6-9 months. Which of the following diagnostic tests would be most useful in confirming the most likely diagnosis?

- Serum total and free T4 levels
- Trypsin-like immunoreactivity
- Dexamethasone suppression test
- Blood glucose curve
- Water deprivation test

Explanation - This case describes the typical presentation of equine pituitary pars intermedia dysfunction (PPID), sometimes referred to as equine Cushing's disease. The disease is a progressive disorder of pituitary enlargement (adenoma). The condition usually affects horses greater than 15 years of age and may affect any breed but ponies and Morgan horses have increased incidence. The classic symptom which is highly suggestive of this condition is hirsutism which is the symptom of a long curly hair coat that does not shed properly. Other symptoms include PU/PD, laminitis, lethargy, excessive sweating or lactation, decreased muscle mass, infertility, and susceptibility to infections such as tooth root abscesses.

Hirsutism as a clinical sign is the most sensitive indicator of PPID. Diagnosis of PPID by laboratory testing in horses with subtle signs can be challenging since no single test is absolutely sensitive and specific, but the most commonly used tests are the **dexamethasone suppression test** and the measurement of endogenous ACTH levels. Although the dexamethasone test is thought to be the most reliable, there are concerns about seasonal hormonal fluctuations that can lead to false positives in the fall. In horses with laminitis, it may also be desirable to avoid administration of dexamethasone.

Treatment aims to decrease clinical signs and does not typically result in a cure or complete remission of

all signs. Pergolide is generally considered the treatment of choice. Pergolide is a dopamine agonist that is used to treat Parkinson's disease in humans. The drug acts to suppress pituitary hormone secretion. Older references will refer to the use of cyproheptadine which is a serotonin antagonist as a preferred treatment for PPID. There is also investigation that trilostane, a 3-beta hydroxysteroid dehydrogenase inhibitor may be useful in the management of PPID.

Question

In the Spring of 2001, a syndrome later termed Mare Reproductive Loss Syndrome, also known as MRLS, occurred in central Kentucky. This resulted in the abortion of 20-30% pregnant mares. Which of the following was NOT a manifestation of MRLS?

- Early fetal loss
- Late-term abortion
- Neonatal foal deaths
- Fetal or neonatal hemoabdomen
- Fibrinous pericarditis

Explanation - The correct answer is fetal or neonatal hemoabdomen. All other choices listed were potential disease manifestations of MRLS. The exact pathogenesis of MRLS is still unknown, but the presence of eastern tent caterpillars was strongly associated with the disease. Later, experimental studies in which pregnant mares were exposed to or fed, via NG tube, eastern tent caterpillars resulted in early and late fetal loss.

Question

Which of these control measures has led to the eradication of screw worms (Cochliomyia hominivorax) in the USA and Mexico?

- Release of sterile males
- Use of pyrethrins
- Release of sterile females
- Use of ivermectin

Explanation - The correct answer is release of sterile males. This has been successful because female flies tend to mate only once. Clinical signs will be primary myiasis. Since the screw worm has been eradicated, any suspicious clinical signs should be reported to the feds.

Question

You are examining a 3-day old neonatal foal for suspected sepsis. Upon review of a blood smear, you notice the blue aggregates in many of the neutrophils (see image). What are these called and what do they suggest?

- Barr Bodies suggestive of endotoxemia
- Neutrophil hypersegmentation suggestive of bacterial phagocytosis
- Dohle Bodies indicating toxic change to the neutrophil
- Weible-Palade bodies suggestive of systemic inflammation

Explanation - Dohle bodies are bluish-gray inclusions within the neutrophil that are retained aggregates of rough endoplasmic reticulum. Dohle bodies are one manifestation of toxic (i.e. endotoxemia) morphologic change to the leukocytes.

Other changes in neutrophil morphology that occur with toxemia include cytoplasmic basophilia, vacuolation, and toxic granulation. These changes are commonly found in septic foals and may be considered "defects" in the neutrophil during intense cell production and maturation. In this image, there are numerous dark blue aggregates suggestive of Dohle bodies.

Question

Equine herpesvirus-3 (coital exanthema) is a cause of which of the following?

- Infertility in stallions
- Balanoposthitis
- Abortion
- Infertility in mares

Explanation - The correct answer is balanoposthitis. EHV-3 causes papules, pustules, and ulcers to the vestibular mucosa, vulvar skin, and the penis and prepuce (balanoposthitis). Less frequently, it can involve the skin of the face. There are no systemic signs or consequences of the infection, although secondary bacterial infections are possible. Spontaneous recovery usually occurs over about 2 weeks, and no treatment is usually required except sexual rest to prevent spread as balanoposthitis is venereally transmitted.

Question

Which of the following can cause aggression in mares?

- Sertoli Cell tumor
- Luteal cyst
- Melanoma
- Granulosa cell tumor

Explanation - Granulosa-theca cell tumors are the most common ovarian tumor in horses and can cause increased levels of testosterone, sometimes causing aggressive behavior towards people. Another cause of aggression in horses is hypothyroidism

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Question

A mare has aborted due to an equine herpesvirus-1 infection. What would you tell the owner about her future as a breeding horse?

- Future breeding possibilities should be unaffected, but she is not permanently immune to the virus
- She is now permanently immune to the virus and should not have another abortion due to equine herpesvirus again
- She should not be bred to prevent spread of the virus
- She will be latently infected and likely to have future abortions due to recrudescence of the virus

Explanation - The correct answer is future breeding possibilities should be unaffected, but she is not permanently immune to the virus. Mares do not acquire permanent immunity and may be infected again at a subsequent pregnancy. However, barring another infection, future fertility should be unaffected. Vaccination of the mare during her next pregnancy against EHV (gestational months 5, 7 and 9) may help lessen the chance of abortion

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Question

You wish to sedate a horse to re-check a lesion on the hind leg. Which of the following choices will provide the shortest duration of action?

- Medetomidine
- Xylazine
- Romifidine
- Detomidine

Explanation - The correct answer is xylazine. Xylazine has the lowest receptor affinity, duration of action, and has the largest dose requirement of the alpha 2 agonists. Although xylazine will provide the shortest duration of action, clinicians are told to be careful when using xylazine and working with the hind limbs because these horses can have a sudden rapid limb movement known as a phantom kick. Sedative effects of xylazine last for about 20 minutes. Sedative effects of detomidine typically last approximately 90

minutes; however, peak sedation is achieved for 10-20 minutes. Romifidine is similar to detomidine; however, the side effects are believed to be decreased.

Question

If a horse is in seasonal anestrus, which of these is the most effective means of hastening the start of the breeding season?

- Provide artificial light for 12 hours per day 30 days prior to the start of breeding
- Provide artificial light for 12 hours per day 60 days prior to the start of breeding
- Provide artificial light for 16 hours per day 60 days prior to the start of breeding
- Provide artificial light for 16 hours per day 30 days prior to the start of breeding

Explanation - The correct answer is to provide 16 hours of artificial light 60 days prior to the start of breeding. To get a horse to transition out of seasonal anestrus, you can gradually increase the amount of light to 15-16 hours per day to initiate ovarian activity. It usually takes at least 60 days until physiologic breeding will occur. There are hormonal methods to promote cycling, but they are less consistent than altering light.

Question

A new horse owner calls you and wants to know how to prevent calcium carbonate urolith formation in a horse. Which of the following promotes calcium carbonate urolith formation?

- Low amounts of mucoproteins
- Low urine specific gravity
- Maintaining an acidic urine pH
- Maintaining an alkaline urine pH

Explanation - The correct answer is maintaining an alkaline urine. Calcium carbonate stones in horses have a higher likelihood of forming in alkaline urine. Mucoproteins in urine may serve as a nidus for stone formation but is not specific for calcium carbonate stones.

Question

Which of these is not an expected lab finding in a horse with pituitary pars intermedia dysfunction (also known as Cushing's disease)?

- Stress leukogram
- Hyperglycemia
- Elevated alkaline phosphatase
- Low urine specific gravity

Explanation - The correct answer is an elevated alkaline phosphatase. The horse, unlike the dog, does not have a steroid-induced isoenzyme of alkaline phosphatase. Hyperglycemia is common due to the

counter-insulin effects of cortisol. Low urine specific gravity is a common feature of Cushing's seen in dogs and horses and is the reason affected animals are polyuric and polydipsic. The stress leukogram (neutrophilia, lymphopenia) is due to the effects of cortisol as well.

Question

You are visiting Egypt with a friend and go to a horse farm where you see several horses with swelling in the indentation above the eyes. You recall from your classes in veterinary school that swelling of the supraorbital fossa is a characteristic sign of which of the following exotic diseases?

- Rift Valley Fever
- Surra
- African Horse Sickness
- Glanders

Explanation - African horse sickness (AHS) is a viral disease of equids that is transmitted by insects, primarily Culicoides. Clinical signs of AHS typically develop 5-7 days after infection and begin with fever and conjunctivitis. Some animals may recover but many go on to develop the pulmonary and/or cardiac form of AHS.

The pulmonary form consists of acute respiratory distress, coughing, sweating, and foaming from the nostrils; this form is usually fatal.

The cardiac form consists of edema of the head and neck as well as abdominal pain and depression. A characteristic sign is swelling in the indentation above the eyes (also referred to as swelling of the supraorbital fossa). About 50% of animals with the cardiac form die from heart failure while the rest gradually recover after about one week.

Question

A horse presents to you in respiratory distress. You perform blood gas analysis and get the following results: PaCO2- 60 mmHg, PaO2- 75 mmHg, pH 7.255, Base excess= -1.8. How would you describe this horse's status?

- Hyperventilation, respiratory alkalosis
- Hypoventilation, respiratory alkalosis
- Hyperventilation, respiratory acidosis
- Hypoventilation, respiratory acidosis

Explanation - The correct answer is hypoventilation, respiratory acidosis. Hypoventilation is defined by the PaCO2. Normal is about 40 (35-45). This horse has an elevated PaCO2 indicating he is under-ventilating and not blowing off sufficient CO2. This increase in CO2 causes a respiratory acidosis because CO2 is an acid that interacts with carbonic anhydrase to form carbonic acid. This is why the horse's pH is low (normal pH is about 7.4). The relatively normal base excess indicates there is minimal metabolic component to this horse's acidosis.

Question

About what percentage of a horse's dry matter intake should be protein for an adult horse with maintenance requirements?

- 12%
- 24%
- 6%
- 18%
- 30%

Explanation - The correct answer is 12%. A horse requires about 1.3 g protein per kilogram body weight (**650 g protein for 500 Kg horse**) or about 40 g of protein per 1000 calories. This corresponds to about **12% of dry mater intake**. Obviously, other factors play some role, including the quality of the protein source. In general, excess protein does not cause horses any health problems, but it can be an unnecessary expense for owners. Too little protein can result in malnutrition problems.

Question

What breed of horse is predisposed to the development of combined immunodeficiency?

- Appaloosa
- Thoroughbred
- Arabian
- Quarterhorse

Explanation - The correct answer is Arabian. Arabian foals can develop combined immunodeficiency (CID) characterized by a lack of production of functional lymphocytes. No curative treatment exists, and foals will succumb to infection. In a CID foal, the foal typically has immunity from maternal antibodies for the first few months of life. However, as maternal antibodies begin to wane after 2-3 months, foals with CID will begin to develop recurrent infections that are responsive to antimicrobials. Once antimicrobials are discontinued, infection returns. Owners should be advised on the heritable nature of this disease. A genetic blood test is available to determine if a horse is a carrier of the CID trait.

Question

Endotoxemia is a term applied when an animal exhibits multiple adverse clinical signs including one or more of the following: fever or hypothermia, leukopenia, tachycardia, tachypnea, obtundation, and a change in gut motility. These physiologic effects are caused by what?

- DNA from Gram negative bacteria
- An adverse reaction to aspirin, phenylbutazone or other NSAIDs
- Bacterial lipopolysaccharide
- Cell wall components of Gram positive bacteria
- Exotoxins from Clostridial organisms

Explanation - The cell walls of all Gram negative bacteria contain varying amounts of lipopolysaccharide, which in turn varies in its potency to create adverse reactions in animals. The signals have evolved on monocytes and macrophages to warn the animal when a Gram negative bacterium has gained access. When the reaction to this signal is overzealous, a cascade of adverse physiologic reactions can occur.

Question

A 3 month old Arabian colt is presented for 3 episodes of pneumonia; the first episode of pneumonia was observed at 7 weeks of age. Each episode of pneumonia is responsive to oral antimicrobials, but when these are discontinued, evidence of respiratory disease occurs several days later. A complete blood count reveals that the foal is persistently lymphopenic. What condition should you suspect?

- Leukocyte adhesion disorder
- IgM Deficiency
- Viral pneumonia
- Combined immunodeficiency

Explanation - The correct answer is combined immunodeficiency. Any Arabian foal with persistent infection should be suspected of having this heritable immunodeficiency of B and T lymphocytes. Typically, foals with CID do not demonstrate evidence of repeated infection until maternal antibodies begin to wane. There is no treatment for this disease.

Question

Which of the following is not a possible cause for icterus in a horse?

- Hemolysis
- Oleander ingestion
- Clostridium piliformis
- Theiler's disease
- Anorexia

Explanation - The correct answer is oleander ingestion. Oleander contains a cardiac glycoside and will kill a horse by causing arrhythmias and stopping the heart. Anorexia and hemolysis cause a prehepatic icterus. Theiler's disease is an acute, diffuse, necrotizing hepatitis that occurs after receiving serum products and can cause a hepatic icterus. Tyzzer's disease is caused by Clostridium piliformis and can cause a hepatic icterus.

Question

Normal position for an equine fetus ready to be delivered is _____?

- Posterior presentation, dorsosacral position with forelimbs flexed at the carpi
- Anterior presentation, dorsosacral position with forelimbs flexed at the carpi
- Anterior presentation, dorsopubic position with forelimbs extended

- Anterior presentation, dorsosacral position with forelimbs extended

Explanation - The correct answer is anterior presentation, dorsosacral position, with forelimbs extended. This means the fetus's head is coming out first rather than the rear end. It is positioned such that the dorsum of the fetus is adjacent to the sacrum of the mare, and the forelimbs are completely extended forward. Abnormal postures lead to the fetus taking up more room in the pelvis and can lead to dystocia if not corrected.

Question

In what cell of the horse does Ehrlichia equi survive in?

- Monocyte
- Neutrophil
- Myocyte
- Erythrocyte

Explanation - The correct answer is neutrophil. Ehrlichia equi causes equine granulocytic ehrlichiosis. It can survive in host neutrophils and eosinophils and is frequently found on a blood smear during the acute phase of the disease. This is in contrast to Ehrlichia risticii (which was recently renamed Neorickettsia risticii), the agent of Potomac horse fever, which survives in monocytes and is rarely found in a blood smear. Clinical signs of Ehrlichia equi infections include depression, limb edema, petechiation, icterus, and ataxia. It is usually a fairly mild disease.

Question

You are presented with a 7-year old Morgan horse with the complaint of lameness. You find a normal TPR, but the animal is grossly obese and has evidence of chronic laminitis. The physical exam is otherwise unremarkable. Which of the following best describes this condition?

- Pheochromocytoma
- Equine Cushing`s syndrome
- Pituitary pars intermedia dysfunction
- Equine metabolic syndrome
- Diabetes insipidus

Explanation - EMS is characterized by gross or severe regional obesity and clinical or subclinical laminitis. These animals are insulin-resistant and often have higher than normal insulin levels in blood.

Question

Which of the following is NOT considered a minimum requirement for a written veterinary medical record?

- Written history of the animal's condition
- A diagnosis

- Estimate of cost of recommended treatment for the animal
- Any medications prescribed to the animal
- Color of the animal

Explanation - Medical record requirements are specified by the Veterinary Practice Acts. While these acts do vary by state, the basic requirements are the same. The minimum inclusions are the following: Owner name, address and telephone, patient name or identification, species, breed, age, sex, and color of the animal, immunization record, dates of custody, history of the animal's condition, physical examination findings and any laboratory data, a provisional or final diagnosis, treatment and medications administered, prescribed, or dispensed, surgery and anesthesia reports, progress reports, and radiographic and lab results.

Other items that should be included in the medical record to protect from litigation but are NOT required by the minimum requirements include authorization or waiver forms for treatment, estimates for services, and records of all communications with clients.

Question

What is the treatment for a persistent corpus luteum that will allow a return to estrus in a mare?

- PGF-2-alpha (prostaglandin) injection
- Gonadotropin-releasing hormone (GnRH) injection
- Progesterone injection
- Human chorionic gonadotropin (hCG) injection

Explanation - The correct answer is PGF-2-alpha injection. PGF will cause lysis of the corpus luteum in mares if the corpus luteum is more than about 5 days old. If you are unsure how old the corpus luteum is, you can repeat the injection in about 7 days. This will allow a return to normal cycling. Remember, injection of PGF may cause mild-moderate abdominal pain (colic, cramping) after administration. Progesterone injection would not change things because the horse already has high levels of progesterone due to the persistent corpus luteum. hCG stimulates ovulation, but if the horse has high progesterone from the corpus luteum, it will not exhibit a behavioral estrus. GnRH would have similar effects.

Question

You are called to examine an 18-year old horse with the complaint of not shedding out this spring and having less energy. The horse is hirsute, has loss of muscle mass, and has evidence of chronic laminitis. The owner also complains that the animal drinks twice as much as her other horses and seems to urinate a lot. Based on this history and these signs, what diagnosis should be at the top of your list of differential diagnoses?

- Hypervitaminosis D
- Adrenal hyperplasia
- Hyperthyroidism

- Pituitary pars intermedia dysfunction
- Parathyroid gland malfunction

Explanation - This disorder used to be called equine Cushing's. This condition is a result of hypertrophy, hyperplasia, and micro- or macroadenoma of the pituitary pars intermedia that secretes increased amounts of propiomelanocortin peptides. Adjacent pituitary tissues are compressed and secrete less of some other peptides. Data suggest that horses with this disease have hypothalamic dysfunction and decreased amounts of dopamine.

Question

Which of the following conditions is most likely to cause an elevated level of serum bilirubin in a 7-year old horse?

- Acute myopathy
- Renal failure
- Hypokalemia
- Hemolytic anemia
- Metabolic acidosis

Explanation - Hemolysis results in an increase in bilirubin (mainly the unconjugated form) as the damaged red blood cells are removed and the hemoglobin is processed through the liver. Of course, liver disease with failure can also cause elevated bilirubin. In liver disease, both the conjugated and unconjugated forms are elevated.

Question

A 5-day old foal presents with weakness, rapid breathing, and fever. Which of these methods would be the most useful test for rapid detection of failure of passive transfer?

- Zinc sulfate turbidity test
- Measurement of total protein (refractometer)
- Radioimmunodiffusion (RID)
- ELISA (SNAP) test

Explanation - The correct answer is the **ELISA** or **SNAP** test, which takes approximately 5 minutes to perform. While all the tests listed can be used to evaluate passive transfer, the ELISA would be the most practical and quickest means of evaluation of passive transfer. The RID is the most accurate but takes 24 hours to perform. Measurement of total protein is a very insensitive test but can be used if no other means are available. Evaluation of total protein is prone to error because hemoconcentration may falsely elevate the total protein.

Question

A mare is brought to you for anestrus during the breeding season and being non-receptive to stallions for 2 months. She previously had a normal pregnancy in past years. On rectal palpation, you find follicles in the ovary. What is the most likely cause of the mare's signs?

- Gonadal dysgenesis
- Persistent corpus luteum
- Pregnancy
- Granulosa-thecal cell tumor

Explanation - The correct answer is persistent corpus luteum. Progesterone made by the corpus luteum prevents estrus. There will be follicles in the ovaries, and the horse may still ovulate but is non-receptive to stallions. The corpus luteum is usually not palpable. A granulosa cell tumor is less likely because usually 1 ovary is large and the other small, unless there are bilateral tumors, which is uncommon. Gonadal dysgenesis is a chromosomal abnormality, and the mare would not have been able to have had a normal pregnancy previously. Pregnancy has been ruled out by your rectal palpation, since it has been months.

Question

A pregnant mare was brought out to your barn for observation in anticipation of parturition. After several hours of restless behavior, several gallons of allantoic fluid rush out from the vulva. Which of the following would you expect to happen next for a normal parturition?

- The red, velvety, chorioallantoic membrane emerges from the vulva
- The placenta is expelled from the vulva
- The thin, white, glistening amniotic membrane emerges from the vulva
- The hind legs of the foal emerge from the vulva

Explanation - This case description is consistent with stage I of labor in the horse. The first stage of foaling typically lasts 30 minutes to 4 hours. During this stage, mares act restless and may exhibit signs similar to colic such as flank watching, pawing, and constantly getting up and down. When the placenta ruptures ("water breaks"), there may be several gallons of allantoic fluid that come out. Usually, within about 5 minutes, the second stage of labor begins and the foals feet and nose appear at the vulva, covered in the white, thin, glistening amnion. If a red, velvety, membrane is seen, this is the chorioallantois which indicates premature placental separation which can impair oxygen delivery to the fetus and can result in death of the foal. Usually, the muzzle will emerge from the amnion by the time the foal's hips pass through the pelvis but if not, the amnion can be gently broken and removed. Usually, the umbilical cord breaks naturally when the mare stands or foal begins to rise. Then, within 30 minutes to 3 hours after foaling, the placenta should be expelled.

Question

Many times, horses require additional muscle relaxation during anesthesia. Which of the following is commonly used for its property of being a centrally acting muscle relaxant?

- Atracurium
- Guaifenesin
- Succinylcholine
- Ketamine

Explanation - The correct answer is guaifenesin. Unfortunately, the exact mechanism is unknown; however, we do know that guaifenesin acts centrally by blocking nerve impulse transmission at the internuncial neuron level in the subcortical brain, brain stem, and spinal cord. Veterinarians should be careful not to give too much guaifenesin because early signs of toxicity are in the form of increased rigidity. So what does the vet do? Give more guaifenesin, causing respiratory and cardiac arrest. Ketamine is a dissociative agent and is known for its ability to cause hypertonia. Atracurium is a non-depolarizing neuromuscular blocking agent that acts by competitively binding to cholinergic receptors at the motor endplate. Succinylcholine is a depolarizing neuromuscular blocking agent.

Question

A horse owner in Louisiana calls you frantically concerned that he has heard reports of African Horse Sickness in adjacent states and he wants to know what he can do to protect his horses. Which of the following is the best recommendation for preventing transmission of this disease?

- Separate all horses from each other and all other animals because horses are most commonly infected by direct contact with infected animals
- Treat all horses with oxytetracycline because the etiologic agent is exquisitely sensitive to this antibiotic
- Institute strict arthropod control measures because the disease is transmitted primarily by Ixodes ticks
- Stable all horses in insect-proof housing, particularly at night because the disease is transmitted primarily by Culicoides flies
- The owner should not travel to any of the states where the disease is present because the virus is transmitted by fomites and can survive for extended periods

Explanation - African horse sickness (AHS) is a viral disease of equids that is transmitted by insects, primarily Culicoides.

African horse sickness is endemic in sub-Saharan Africa and outbreaks have periodically extended to the Middle East and southern Spain. The primary and biological vector is Culicoides but the virus may also be transmitted by mosquitoes. The virus has been isolated from certain ticks but arthropod transmission is not believed to play a significant role.

Clinical signs of AHS typically develop 5-7 days after infection and begin with fever and conjunctivitis. Some animals may recover but many go on to develop the pulmonary and/or cardiac forms of AHS. The pulmonary form consists of acute respiratory distress, coughing, sweating, and foaming from the nostrils;

this form is usually fatal. The cardiac form consists of edema of the head and neck as well as abdominal pain and depression. A characteristic sign is swelling in the indentation above the eyes (also referred to as swelling of the supraorbital fossa). About 50% of animals with the cardiac form die from heart failure while the rest gradually recover after about one week.

Diagnosis can often be made based on history of exposure to endemic areas, clinical signs and lesions but must be confirmed by viral isolation and/or serology. There is no effective treatment and prevention/control can be accomplished by vector control and vaccination. There are multiple serotypes of virus and animals immunized against certain serotypes are still susceptible to others. In an outbreak situation, affected horses should be removed/euthanized and remaining horses should be vaccinated with a polyvalent vaccine until the specific serotype can be determined and then animals should be revaccinated with the corresponding vaccine.

For importing equids from Africa, a 2 month quarantine is required and then horses must test free of virus. Presence of antibodies does not disqualify a horse from importation. Because of the vector-borne nature of the disease, it is recommended that planes flying from endemic areas be sprayed with insecticides on arrival to disease-free countries.

Question

In what season is anestrus normal in the horse?

- Fall
- Spring
- Winter
- Summer

Explanation - The correct answer is winter. It is normal for horses to be in anestrus in the winter season. They will not respond to teaser stallions and have inactive ovaries and uterus. As the length of day increases at the end of the winter, the horses should return to normal cycling. This can be brought on with artificially increasing the length of light exposure. At the end of this period, it is normal for mares to have an inconsistent transitional period as they return to breeding. This is referred to as the vernal transition.

Question

What is the daily normal water consumption rate for an average 450 kg horse?

- 60 liters of water
- 30 liters of water
- 1 liter of water
- 10 liters of water
- 5 liters of water

Explanation - The correct answer is 30 liters of water. Horses consume about 50-70 ml water/kg/day, this will vary somewhat based on temperature, diet, and other factors. However, of these choices, 30 liters is the best choice. Normal urine production in the horse is about 15-30 ml/kg/day.

Question

You are examining a 13-year old Standardbred brood mare 5 hours after parturition. You note that the placenta is still present in the reproductive tract of the mare (see image). What is the most appropriate therapy?

- Administer oxytocin (IM or IV) and lavage the uterus to facilitate removal
- Administer penicillin (IM) until the placenta is expelled on its own
- Do nothing; the placenta is not considered retained until 12 hours post-parturition and it will likely be expelled by this time
- Place physical traction on the placenta and remove it manually

Explanation - Most texts state that the placenta in a mare is retained after greater than 3 hours post-parturition; therefore, this would be considered a retained placenta. Oxytocin, along with uterine lavage, will cause the uterus to contract and facilitate expulsion of the placenta. Strong physical traction on the retained placenta is generally considered contraindicated, as you may tear the placenta and leave remnants of it within the uterus, resulting in possible complications. Broad-spectrum antimicrobials are often administered to decrease the incidence of metritis but alone would not be appropriate.

Question

A mare in the last month of gestation develops ventral edema from the udder to the xiphoid. She then becomes acutely painful and tachypneic and does not want to ambulate. What condition did the mare experience?

- Colonic torsion
- Vaginal cystocele
- Ruptured prepubic tendon
- Uterine torsion

Explanation - The correct answer is ruptured prepubic tendon. This tendon courses along the ventrum and provides the major support for all the structures in the equine abdomen. It can rupture in late pregnancy, especially in obese draft mares. This is usually preceded by ventral swelling. If such swelling is noted, preventative measures should be taken such as restricting activity and possibly slinging the abdomen to provide support. This condition is very painful to the mare and may affect the ability to increase intra-abdominal pressure during parturition. Assisted parturition by a veterinarian should be strongly considered. A body wall hernia may also result in similar signs as a ruptured prepubic tendon.

Any late-pregnant mare presenting with a rapidly enlarging abdomen and often an area of painful oedema along the ventral abdominal wall could be suffering from rupture of the abdominal musculature (oblique and transverse abdominal muscles: a ventral hernia) or rupture of the rectus abdominis muscle or rupture of the prepubic tendon. These can occur together or separately in pregnant mares. In practice, ventral herniation, rupture of the rectus abdominus muscle and rupture of the prepubic tendon can be considered as one condition under the collective heading of ventral ruptures. This would seem a reasonable approach, as the conditions are all defects of the abdominal wall. There may be some obvious clinical differences in presenting signs as discussed below. Other clinical conditions would include haematoma - subcutaneous or intramuscular and placental hydrops as a primary cause leading to the above. Video

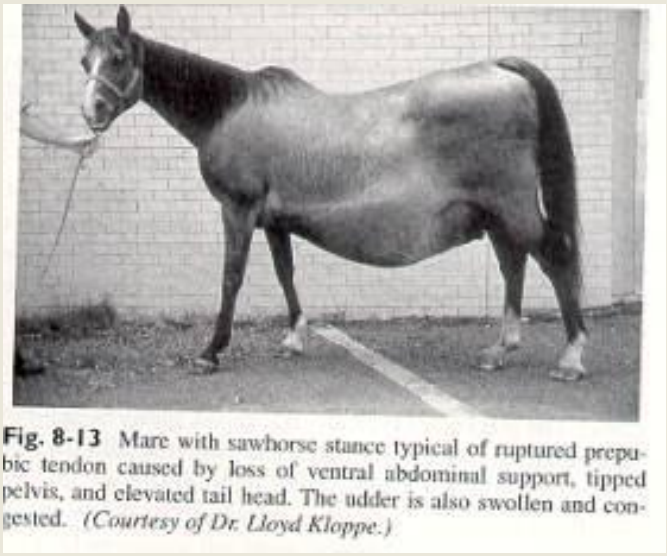

Fig. 8-13 Mare with sawhorse stance typical of ruptured prepubic tendon caused by loss of ventral abdominal support, tipped pelvis, and elevated tail head. The udder is also swollen and congested. *(Courtesy of Dr. Lloyd Kloppe.)*

Question

You have been treating a horse with aminoglycosides and are worried about toxicity as a result of the owner overdosing the horse. Which of the following diagnostic test will be the most practical to perform?

- Alkaline phosphatase, sorbitol dehydrogenase, and glutamyl transferase
- BUN and creatinine
- Glucose
- Phosphorus

Explanation - The correct answer is BUN and creatinine. Toxicity associated with aminoglycoside administration will result in renal tubular nephrosis. Therefore, monitoring changes in BUN and creatinine will be indicated.

Question

Which of these is least likely to result in hypothyroidism in a foal?

- Pituitary adenoma
- Inadequate iodine intake by the mare
- Inadequate iodine intake by the foal
- Excessive iodine intake by the mare

Explanation - The correct answer is pituitary adenoma. Pituitary adenomas are rare causes of hypothyroidism although they can cause Cushing's disease. However, they usually occur in old horses (average age is about 20 years). In a foal, an iodine deficiency can lead to hypothyroidism because iodine is required in thyroid hormone. Iodine excess can also cause hypothyroidism due to damage to the thyroid. This is referred to as the Wolff-Chaikoff effect, although you don't need to know that name. Iodine deficiency or excess can come from the mare or from the foal's diet. Hypothyroidism in foals can be life-threatening and can cause abnormalities including physeal dysgenesis, incoordination, limb deformities, tendon ruptures, stillbirths, weakness, and death.

Question

Which of these tests is most reliable in diagnosing a uterine infection in a mare?

- Uterine cytology
- Cervix culture
- Uterine culture
- Complete blood count

Explanation - The correct answer is uterine cytology. Endometrial cytology will show a more quantitative measure of not only bacteria but of leukocytes. Because there are many commensal organisms found in and around the uterus, culture is neither sensitive nor specific. However, it is often a worthwhile test to determine what organisms are there and to design an appropriate antibiotic plan based on susceptibility results. A cervical swab is less reliable than an endometrial sample. CBC is neither sensitive nor specific for diagnosing endometritis. The presence of a high percentage of neutrophils in an endometrial cytology is very suggestive of uterine infection, especially if bacteria are also seen.

Question

How much sodium bicarbonate must be given to a 470kg horse that has a base deficit of 13 to completely correct this deficit?

- 600 mEq
- 2400 mEq

- 4500 mEq
- 1100 mEq

Explanation - The best answer is 2400 mEq. The formula you need to know to calculate how much sodium bicarbonate you need (depending on your reference source) is **0.3 to 0.4 x BW x Base Deficit**. Plug and chug (using 0.4) and you get 2444, which is the closest answer.

In practice, you may choose to fix only part (often half) of the total calculated bicarbonate and reassess, but this question asks how much is needed to completely correct the deficit.

If you need a reminder, the base deficit is the amount of base that you would need to add to a solution (i.e. plasma) to achieve a pH of 7.4. In general, the normal HCO3 concentration in blood is around 22-24 mEq/L. The base deficit is simply calculated by subtracting the patient's HCO3 concentration (i.e. 10 from the normal concentration [23]). In the formula, the 0.3 factor that is used to multiply represents the extracellular fluid compartment.

Question

A 48-hour Paint colt is presented to you for lethargy, irregular facial twitching and prolonged recumbency (see image). The owner reports that the gestation was 343 days and parturition was normal. Upon physical examination, the foal heart rate is 88 beats/min, respiratory rate is 10 breaths/min, and the rectal temperature is 101.2F. The foal is difficult to arouse and appears to have mild intermittent seizure-like activity. The foal can stand briefly but has no suckle response. The CBC and biochemistry analysis are within normal limits for a foal of this age; the arterial blood gas (collected while foal was in lateral recumbency) demonstrates the following results:

pH 7.19 (7.35-7.5)
PO2 78 mmHg (~94 mmHg)
PCO2 80 mmHg (36-46 mmHg)
HCO3 42 mEq/L(24-30 mEq/L)
Ionized Ca++ 1.7 mmol/L (1.4-1.8 mmol/L)

What is your interpretation of this arterial blood gas analysis and what is the most likely cause?

- Respiratory acidosis without compensation caused by seizures
- Respiratory acidosis with metabolic compensation caused by atlantoaxial malformation (OAAM)
- Respiratory acidosis with metabolic compensation caused by neonatal encephalopathy (hypoxic-ischemic encephalopathy)
- Respiratory acidosis without metabolic compensation cause by neonatal septicemia
- Respiratory alkalosis with metabolic compensation caused by bacterial meningitis

Explanation - This is a more complicated question that requires evaluation of the entire case. First, recognize the foal's problem list includes: lethargy, hypoventilation, intermittent seizures as well as no suckle response. Next recognize that the arterial blood gas reveals a normal PO2 in a recumbent foal but hypercarbia (respiratory acidosis) with metabolic compensation. Based on these findings, the most likely cause in neonatal encephalopathy.

This disease can arise from hypoxic conditions in utero or during parturition (dystocia, premature placental separation) resulting in a cascade of biochemical derangements within the body. Clinical signs include lethargy, failure to find and nurse from the udder, seizure activity, and in more severe cases damage to the gastrointestinal system and/or kidneys from hypoxia. Many foals are hypercapnic because the respiratory center within the CNS is not operating normal. There can be evidence of infection that complicates the presentation of some foals with neonatal encephalopathy, but in this case the CBC and rectal temperature are normal, making infectious diseases (bacterial meningitis, septicemia) less likely.

You should have some knowledge of what normal arterial blood gas reference intervals are: pH 7.35-7.5; PO2 variable in venous blood; PCO2 around 40 mmHg, HCO3 24-30 mEq/L, iCa++ 1.4-1.8 mmol/L. This is a general range, with each species having slight changes to this range.

Question

A 4-year old Arabian mare is shipped from the United Arab Emirates to New York where you examine the horse. You note that the horse has a mucopurulent discharge from the nares and has labored breathing and cough. Heart rate is 24 bpm, respiratory rate is 40 breaths per minute and temperature is 104.9 F. You make a smear of the discharge and see large numbers of extracellular straight Gram-negative rods with rounded ends. Which diagnostic test is most likely to confirm your clinical suspicion?

- PCR of the exudate for Rhodococcus equi virulence associated plasmid
- Biopsy of the mandibular lymph node
- Mallein test
- Viral culture of a guttural pouch wash
- PCR of the exudate for SeM protein of Streptococcus equi subsp. equi

Explanation - The horse's history of arrival from the United Arab Emirates along with the clinical and cytologic findings are consistent with the nasal form of glanders.

Glanders is a bacterial disease caused by Burkholderia mallei (previously known as Pseudomonas mallei). It is thought to be endemic in regions of the Middle East, Asia, Africa, and South America. Glanders can cause disease in donkeys, mules, and small ruminants. Glanders is primarily a concern in horses because they can be chronic or occult carriers that intermittently shed this deadly and potential zoonotic pathogen.

Burkholderia mallei causes 3 different forms of disease; nasal glanders, pulmonary glanders, and cutaneous glanders (also referred to as Farcy).

The nasal form presents with high fever, loss of appetite and labored breathing with cough. Viscous mucopurulent discharge or crusting may be present around the nares. There may be ulceration of the upper respiratory passages that resolve in the form of star-shaped cicatrices ("stellate scars"). Regional lymph nodes may be enlarged and indurated and may rupture or adhere to deeper tissues.

The pulmonary form often develops over several months, beginning as a fever with dyspnea and cough. Lung lesions commence as light colored nodules surrounded by hemorrhage or as diffuse pneumonia. The nodules may become caseous or calcified and discharge contents to the upper respiratory tract. Nodules may also be found in other organs.

The cutaneous form develops over several months, beginning with cough and dyspnea as well. Eventually, nodules develop in subcutaneous tissue along the course of the lymphatics of the legs, costal areas, and ventrum. They can rupture and excrete infectious purulent exudate. Infected lymphatics may form thickened cord-like lesions that sometimes coalesce into a string of beads appearance known as "farcy pipes". Nodular lesions of other organs may also be found.

Burkholderia mallei can be identified in smears made from fresh lesions as mainly extracellular straight Gram-negative rods with rounded ends. Several diagnostic tests exist including PCR, ELISA, and Western

Blot but the two that you actually need to know about because they are used in international trade are complement fixation (CF) serology and the mallein test. The mallein test is considered the most reliable, sensitive, and specific test; it involves injection of mallein purified protein derivative intradermally into the lower eyelid. The test is read at 24 and 48 hours and a positive reaction is characterized by edematous swelling or purulent discharge.

Horses should not be treated; local authorities should be notified if a case is suspect and if disease is confirmed, horses must be humanely destroyed and affected carcasses should be burned and buried.

Question

Which antibiotic is contraindicated in foals?

- Enrofloxacin
- Cefazolin
- Ampicillin
- Gentamicin
- Amikacin

Explanation - The correct answer is enrofloxacin. Enrofloxacin is a fluoroquinolone and thus, its mechanism of action involves the inhibition of DNA gyrase. The reason you don't want to use it in foal is because it can result in arthrotoxicity and subsequent erosion of cartilage. Ampicillin, gentamicin, and amikacin are commonly used to provide broad-spectrum coverage against potential septicemia. Ampicillin is a penicillin; gentamicin and amikacin are both aminoglycosides. Cefazolin is a first-generation cephalosporin that is occasionally used in the face of septicemia if a penicillin is not available.

Question

What stimulates antidiuretic hormone (ADH) secretion in the horse?

- Hyperosmolality and increased circulating blood volume
- Hypoosmolality and increased circulating volume
- Hyperosmolality and decreased circulating blood volume
- Hypoosmolality and decreased circulating volume

Explanation - The correct answer is hyperosmolality and decreased circulating volume. In the horse, as in other species, ADH increases renal water reabsorption and urine osmolality by increasing permeability of the collecting tubules. Osmoreceptors in the hypothalamus detect subtle changes in plasma osmolality. If osmolality rises, you will hope to see ADH secretion so that the urine excreted would be more concentrated. The same is true if circulating volume decreases; thus, a lesser volume of water would be lost. When ADH secretion does not occur or if the kidneys are unable to respond to ADH, this is likely diabetes insipidus, and animals will be very polyuric, polydipsic and have extremely dilute urine.

Question

You suspect that an 18-year old post-parturient Thoroughbred mare has uterine artery hemorrhage based on a low PCV (14%), tachycardia (heart rate 70 beats/min), and the history of foaling 12 hours ago. Which of the following drugs would potentially help in a hemorrhaging mare?

- Low molecular-weight heparin
- Aminocaproic acid
- Aspirin
- Tissue plasminogen activator

Explanation - Aminocaproic acid is the best choice of those listed. This medication is believed to facilitate clot stabilization by blocking the activation of plasminogen to plasmin. As you may recall, plasmin is the active enzyme that dissolves clots; therefore, aminocaproic acid inhibits fibrinolysis. The other medications listed would have an anti-coagulant effect and would be contraindicated in this mare.

Question

A 4-day old foal presents to you for abdominal distension and depression. The owners describe the foal as having frequent attempts to urinate with only small amounts voided. On physical exam, the foal's heart rate is 180 beats per minute and respiratory rate is 60 breaths per minute. What is the most likely cause of the foal's clinical signs?

- Right-sided congestive heart failure
- Hemoabdomen
- Septic peritonitis
- Meconium impaction
- Uroperitoneum

Explanation - The correct answer is **uroperitoneum**. With the foal's history of pollakiuria combined with abdominal distension, tachycardia, tachypnea, and depression, you should suspect uroperitoneum. The most common cause of uroperitoneum is a ruptured urinary bladder from large amounts of pressure on the urinary bladder that often occurs during parturition. Treatment involves surgical repair.

Question

A 10-day old male foal presents to you with urine draining from the navel. On exam, you find an enlarged navel that is painful to the touch and purulent discharge from the opening. Which of the following should you advise the owner?

- Patent urachus is considered normal in foals up to 2 weeks of age
- Patent urachus, as described in the case here, requires systemic antimicrobial therapy and possibly surgical removal
- Chemical cautery is the most effective treatment for patent urachus, which should be performed as soon as possible in this case

- Patent urachus is a heritable sex-linked trait on the X chromosome and the foal and mare should not be bred
- Patent urachus, as described in this case here, will resolve with administration of a NSAID, such as flunixin meglumine.

Explanation - These symptoms are indicative of a foal with a patent urachus; some neonatal foals have a patent urachus for a few days and leak clear, yellow urine. However, in this case, the history describes a purulent discharge which would suggest in infection of the urachal structures and a more serious condition. Thus systemic antimicrobials are indicated to eliminate infectious agents. In some instances (large urachal abscess, urachal necrosis, uroabodmen), surgical removal and repair are indicated. Cases of acquired patent urachus associated with navel infection should not be treated with cauterizing agents as this will potentially seal the urachus but prevent drainage of the infection. In the absence of infection, many cases of patent urachus will close on their own. However, if the problem persists, an ultrasound examination should be performed to reveal any abnormalities associated with the internal structure of the umbilicus. Patent urachus is not known to be due to a genetic mutation in foals

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Question

Calculate the extracellular volume of a 450kg horse.

- 180L
- 270L
- 300L
- 90L

Explanation - The correct answer is 90L. Total body water is 60% of body weight. Extracellular fluid is approximately 1/3 of total body water, therefore 450kg x .6 = 270L x .33 = 89.1L ECF. ECF is composed of plasma, interstitial fluid and transcellular lymph such as CSF and synovial fluid.

Question

In a foal with uroperitoneum, the creatinine in the abdominal fluid will be at least _____ as much as the serum creatinine.

- One fourth
- Half
- 4 times
- Twice

Explanation - The correct answer is twice. This finding is diagnostic for a uroperitoneum. In a foal, this is usually due to urinary bladder rupture at the time of parturition due to large pressures exerted on the urinary bladder during parturition.

Question

You diagnose Pneumocystis carinii pneumonia in a 6-week old Arabian foal. A complete blood count shows:

hematocrit=31% (27-43 %)
neutrophils- 1,300/ul (2,900-8,500/ul)
lymphocytes- 227/ul (1,160-5,100/ul)
monocytes- 800/ul (0-700/ul)
eosinophils- 700/ul (0-780/ul)

Which of the following is the most likely reason for this problem?

- Exposure to Pneumocystis via infected mosquitoes
- Severe combined immunodeficiency
- Failure of passive transfer
- Ingestion of moldy feed
- Aberrant migration of Pneumocystis into the lung

Explanation - Arabian foals that are homozygous for the SCID gene appear normal at birth but then develop fatal infections, often from unusual organisms like Pneumocystis. The SCID trait is autosomal recessive. A genetic test now exists for this disease.

Question

What are the two most common NSAID toxicoses seen in the horse?

- Renal papillary necrosis and right dorsal colitis
- Right dorsal colitis and splenic infarcts
- Right ventral colitis and pulmonary edema
- Bone marrow suppression and hepatic necrosis
- Hepatic necrosis and renal papillary necrosis

Explanation - The correct answer is right dorsal colitis and renal papillary necrosis. The exact reason why the right dorsal colon is susceptible to ulceration as a result of NSAID use is not entirely known. Interestingly, some horses may develop right dorsal colitis even on appropriate doses of NSAIDS. Consistent findings of right dorsal colitis include colic and hypoproteinemia. The lesion in the kidney is classic and is due to the limited blood flow normally supplied to the corticomedullary region of the kidney. This part of the kidney relies on prostaglandins for adequate blood flow; with inappropriate NSAID use, blood flow to this area of the kidney is compromised, resulting in this classic lesion.

Question

Which of these drugs should be used with great caution in stallions due to the risk of causing paraphimosis or priapism?

- Ketamine

- Trimethoprim-sulfa
- Atropine
- Acepromazine

Explanation - The correct answer is acepromazine. Phenothiazine tranquilizers can cause relaxation of smooth muscles and engorgement of the corpus cavernosum with blood, leading to an inability to withdraw the penis into the sheath or paraphimosis. While this drug side effect is very rare, veterinarians should be cautious in the use of acepromazine in stallions and should consider another sedative such as xylazine or detomidine when sedation is necessary.

Question

If you palpate a mare for pregnancy at day 30, what structure are you feeling for?

- Enlarged uterine artery
- Chorionic vesicle
- Ovarian location
- Fetus

Explanation - The correct answer is chorionic vesicle. At this early in pregnancy, the other structures would not be located. A fetus does not become palpable until about 90-120 days. Ovary location and enlarged uterine arteries are not palpably changed until 7 months of pregnancy.

Question

While examining the blood smear from a horse, you detect multiple intracytoplasmic inclusion bodies inside the neutrophils that appear as aggregates of round dark purple dots. What do you suspect these indicate?

- Herpesvirus type 3
- Ehrlichia risticii
- Ehrlichia equi
- Borrelia burgdorferi

Explanation - The correct answer is Ehrlichia equi. Ehrlichia equi infection can cause morulae to be present in neutrophils and eosinophils. Ehrlichia risticii can cause morulae in monocytes but these are rarely seen on blood smears. Borrelia organisms are not seen in peripheral blood and herpes inclusion bodies are intranuclear and would not be seen in a blood smear.

Question

You are examining a 12 year old Quarter Horse that was recently in a barn fire (see image). You suspect that the epidermis, dermis and adnexal (i.e. hair, sweat glands) structures are involved. Based on the structures involved, you would classify this as what type of burn?

- 1st degree burn
- 3rd degree burn
- 4th degree burn
- 2nd degree burn

Explanation - A 3rd degree burn involves the epidermis, dermis, and adnexal structures. Alternatively, a 1st degree (superficial) burn involves the epidermis only; a 2nd degree (partial thickness) burn involves the epidermis and may go down to the deep dermis. 4th degree burns involve total destruction of the skin, fat, fascia, bone and muscle. This classification scheme would generally apply to all animals, not just horses.

Question

You are called to examine a herd of camels which are having diarrhea and exhibiting signs of weight loss and poor body condition. They are on appropriate feed and supplements and their environment appears suitable. The owner says she deworms them once monthy with Ivermectin. You explain that despite her de-worming efforts, there is a good chance they may have an infection of which intestinal parasite?

- Whipworm
- Hookworm
- Giardia
- Tapeworm

Explanation - Camels are highly susceptible to whipworm infection. Whipworm is suspected to be the most common cause of diarrhea in adult camels in the US. Ivermectin, which is so commonly used, is not

typically effective against whipworms which have developed a resistance over time. Panacur is the most effective and safe dewormer for whipworms in camels.

Question

You are called out to examine a 4-year old dromedary that was castrated a few days ago and is now not eating. The groin and prepucial area is extremely swollen. The camel is unable to stand and is drooling. His neck is extended and he appears to be unable to swallow. Which of the following is most likely responsible for these symptoms?

- Clostridium tetani
- Trypanosoma evansi
- Methicillin-resistant Staphylococcus aureus
- Rabies virus

Explanation - This camel is showing signs of tetanus. The organism was likely introduced into the body through the castration wound. It is recommended that camels are vaccinated against tetanus prior to castration.

While rabies may cause paralysis of the tongue and difficulty swallowing, the recent history of castration in this camel makes tetanus most likely.

Trypanosoma is transmitted via flies and causes a slow wasting disease in camels.
