Question

A 12-year old Quarter Horse gelding presented to you for acute diarrhea, mild colic signs and moderate neurologic signs. Upon initial examination, neurologic signs consisted of head pressing, ataxia, recumbency and general lethargy. The vital parameters included a heart rate of 60 beats/min, respiratory rate of 16 breaths/min and rectal temperature of 102.8F. You decide to perform a biochemistry profile with the following abnormalities observed:

Lactate: 6.5 mmol/L; (RR 0-2.5 mmol/L)
Glucose: 180 mg/dL; (RR 80-115 mg/dL)
Ammonia: 608 micromol/L; (RR 12-61 micromol/L)
Sodium: 124 mEq/L; (RR 137-145 mEq/L)
Chloride: 86 mEq/L; (RR 95-105 mEq/L)
Creatinine: 3.4 mg/dL; (RR 1-2.1 mg/dL)
BUN: 30 mg/dL; (RR 14-21 mg/dL)

Based on the clinical signs and clinicopathologic data, you suspect the horse has colitis; how would you best explain the neurologic deficits in this case?

- Neurologic signs associated with hyponatremia and osmotic fluid shifts in the brain
- Neurologic signs associated with hepatic encephalopathy
- Neurologic signs associated with extreme hyperglycemia
- Neurologic signs associated with acute renal failure and azotemia
- Neurologic signs associated with hyperammonemia and intestinal disease

Explanation – The correct answer is Neurologic signs associated with hyperammonemia and intestinal disease. Ok, admittedly this is a tough question, but we do not want to make them too easy. Hyperammonemia has been associated with intestinal disease in horses. The exact cause of the neurologic signs and disease process is unknown, but it is presumed to result from excessive ammonia production within the intestinal tract. This overwhelms the ability of the liver to metabolize ammonia, and subsequently causes the development of encephalopathy.

Diarrhea is a common concurrent problem suggesting a possibility that overgrowth of ammonia producing bacteria causes elevated blood ammonia. In regards to the other possible answers, hyponatremia can cause neurologic deficits if the sodium is very low (100-105 mEq/L), so the sodium of 124 mEq/L in this question rules that option out. The mild azotemia and hyperglycemia are unlikely to cause neurologic deficits and there is no other evidence to support hepatic disease.

Question

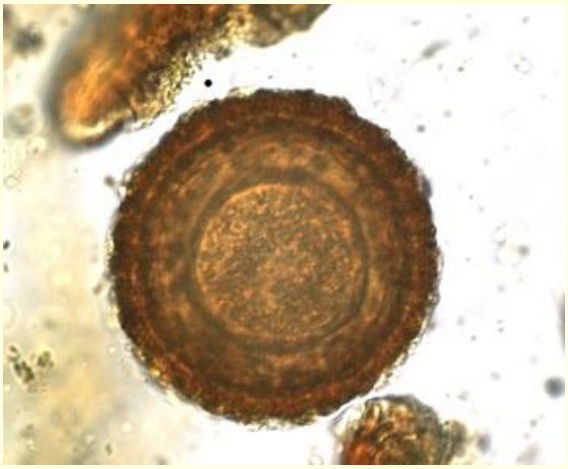
What is the most common cause of colic in a newborn foal?

- Strongylus vulgaris
- Parascaris equorum
- Salmonella
- Nephrosplenic entrapment
- Meconium impaction

Explanation - The correct answer is meconium impaction. Meconium impaction occurs in the rectum or small colon. Clinical signs include straining, swishing of the tail, and restlessness. Rectal examination reveals numerous hard fecal balls. Treatment consists of an enema with water and a mild soap. Meconium is the first intestinal discharges of the newborn foal, consisting of epithelial cells, mucus, and bile.

Question

A foal presents for colic caused by the organism shown in the image below. By which of these mechanisms is colic occurring?



- Thrombosis of the mesenteric artery
- Larval migration
- Immune mediated hypersensitivity
- Enterolith formation
- Intestinal impaction

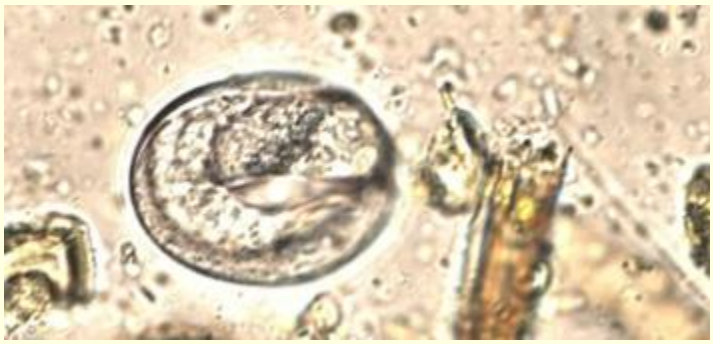
Explanation - This is an image of a Parascaris equorum egg. It is almost spherical in shape with a brown color and contains a single-celled zygote.

In foals, a significant ascarid burden with Parascaris equorum can lead to intestinal impaction and associated

colic. Thrombosis of the mesenteric artery occurs with Strongylus vulgaris infestations. Immune mediated hypersensitivities may occur in adult horses with Parascaris equorum infestations but is unlikely to be a significant cause of the morbidity seen in foals. Larval migration can occur with Parascaris equorum but typically will affect the lungs or liver and this stage of the parasite does not lead to colic. Enteroliths are not caused by gastrointestinal parasitism.

Question

Infection of foals with the parasite whose egg is shown in the image below can be prevented by which of the following?



- Moving the foals to a new pasture
- Prophylactic treatment of the foal with praziquantel
- Disinfecting the environment of the foal
- Treatment of post-partum mares with ivermectin

Explanation - This image shows a Strongyloides westeri (Threadworm) egg. Strongyloides pass from the host in the larvated form and are recognizable as an oval-shaped, thin-shelled embryonated egg.

Strongyloides westeri, intestinal threadworm

Question

A 4-year old male Thoroughbred horse presents to you for colic. During your work up, you note a painful enlargement at the root of the mesentery on rectal palpation. You suspect that the cause of the horse's colic are adults from the egg shown in the picture below. Which of the following drugs effectively kills the adult organisms that can cause this condition?

- Metronidazole
- Piperonyl butoxide
- Ivermectin
- Rifampin
- Praziquantel

Explanation - Colic with an associated painful mass at the root of the mesenery is suspicious for verminous arteritis caused by damage to the cranial mesenteric artery and its branches by Strongylus vulgaris. The strongyle egg shown in the picture confirms the cause in this question. A number of anthelmintics are effective including benzimidazoles, pyrantel and ivermectin.

Question

Horses infected with this parasite may be predisposed to thrombosis of the cranial mesenteric artery.

- Strongylus equinus
- Strongylus vulgaris
- Trichostrongylus axei
- Strongylus edentatus

Explanation - The correct answer is Strongylus vulgaris. S. vulgaris undergoes extensive migration after being ingested as an infective larva. They leave the intestinal tract and travel around in the cranial mesenteric artery and its branches. S. equinus and S. edentatus also migrate throughout the body and may be found in

the liver, pancreas, and perirenal regions. However, these parasites are not as likely to cause thrombosis of the cranial mesenteric artery. Trichostrongylus axei is usually only a problem when horses are in pastures with ruminants as this parasite is usually found in ruminants. The larvae of T. axei will penetrate the mucosa and cause ulceration, thickening of the mucosa, and a chronic gastritis.

Question

Trichostrongylus axei causes which of the following in horses?

- Vomiting
- Respiratory signs
- CNS signs
- Thrombosis and arteritis
- Chronic gastritis

Explanation - The correct answer is chronic gastritis. Trichostrongylus axei is the small stomach worm (hairworm) of horses; it can cause weight loss and chronic gastritis. The parasite is also found in ruminants, and thus it often affects horses that share pastures with ruminants. Treatment includes benzimidazoles or ivermectin. Horses cannot vomit. Thrombosis and arteritis are caused by large strongyles (Strongylus spp.). Respiratory signs can be caused by pulmonary migration of Parascaris equorum

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Question

You are an equine clinician working out in the field. You encounter a colic case and palpate a small intestinal obstruction. You decide to refer the case to a nearby hospital for surgical intervention. What is the most important thing to do before shipping the horse?

- Intubate via nasogastric tube
- Sedate
- Belly tap
- Abdominal ultrasound
- CBC and Chemistry

Explanation - The correct answer is to pass a nasogastric tube. It is crucial to do this, as horses are unable to vomit due to high lower esophageal sphincter tone. By passing the tube, you will allow reflux and relieve life-threatening gastric pressure. Sedation is important to help provide relief; however, gastric rupture will kill the horse first.

Question

Treatment of gastric ulceration is extremely common in racetrack medicine. Which of the following is a Hydrogen-Potassium ATPase blocker?

- Misoprostol
- Omeprazole
- Cimetidine
- Sucralfate

Explanation - The correct answer is omeprazole. Omeprazole is a proton pump blocker (hydrogen-potassium ATPase). Cimetidine is an H2 antagonist as well as ranitidine and famotidine. Sucralfate protects the mucosa by binding to ulcers and protecting from further damage. PgE1 analogs (misoprostol) increase gastric blood flow, decrease gastric secretion of acid, and increase mucous and bicarbonate secretion.

Question

By what mechanism does Parascaris equorum typically cause colic in foals?

- Immune mediated hypersensitivity
- Intestinal impaction
- Larval migration
- Thrombosis of the mesenteric artery

Explanation - The correct answer is intestinal impaction. In foals, a significant ascarid burden with Parascaris equorum can lead to intestinal impaction and associated colic. Thrombosis of the mesenteric artery occurs with Strongylus vulgaris infestations. Immune mediated hypersensitivities may occur in adult horses with Parascaris equorum infestations but is unlikely to be a significant cause of the morbidity seen in foals. Larval migration can occur with Parascaris equorum but typically will affect the lungs or liver and this stage of the parasite does not lead to colic.

Question

What is the dental formula of a horse?

- 2(I2/3 C1/1 P 3-4/3 M3/3)
- 2(I3/3 C1/1 P 3-4/3 M3/3)
- 2(I3/3 C1/1 P3-4/3 M2/2)
- 2(I3/3 C0/0 P3/3 M2/3)

Explanation - The correct answer is 2(I3/3 C1/1 P3-4/3 M3/3). Horses may have either 3 or 4 maxillary premolars.

Question

What is the most common gastric neoplasia in the horse?

- Squamous cell carcinoma
- Mesothelioma
- Lymphosarcoma
- Adenocarcinoma

Explanation - Squamous cell carcinoma is the most commonly reported gastric neoplasia in the horse; the other answers have been rarely observed. Presenting signs include weight loss and colic. Unfortunately, there is no effective treatment at this time.

Question

While performing a necropsy on a 9-year old Thoroughbred mare, you notice the pictured parasite within the stomach. What is your diagnosis?

- Onchocerca
- Strongyloides westeri
- Gasterophilus intestinalis
- Parascaris equorum

Explanation - Gasterophilus are not worms but rather bot fly larvae and are also known as the stomach bot. There are several species, G. nasalis, G. haemorrhoidalis, and G. intestinalis. While they may appear disgusting, they typically do not cause any clinical signs. It has been reported that bot fly infestation can lead to stomach rupture, but this is extremely rare.

Question

Infection of foals with Strongyloides westeri can be prevented by which of the following?

- Treatment of post-partum mares with ivermectin
- Prophylactic treatment of the foal with praziquantel
- Disinfecting the environment of the foal
- Moving the foals to a new pasture

Explanation - The correct answer is treatment of post-partum mares with ivermectin. Larvae of Strongyloides westeri (Threadworm) is transmitted to foals in the mare's milk. Adult horses rarely have patent infections except when larvae harbored in their tissues migrate into a mare's milk after parturition. The worms are found in the small intestine and may cause diarrhea in young horses. Ivermectin or oxibendazole are effective in treatment of S. westeri.

Question

You have diagnosed gastric ulceration in a 3-year old horse via endoscopy and wish to pursue the most effective possible medication for reducing gastric acidity and increasing gastric pH. Which of these drugs most effectively accomplishes this in the horse?

- Bethanechol
- Cimetidine
- Omeprazole
- Dexamethasone
- Metoclopramide

Explanation - Omeprazole is a proton pump inhibitor, and has been found in comparative trials to be more effective in the equine at reducing gastric acidity and raising gastric pH than the others.

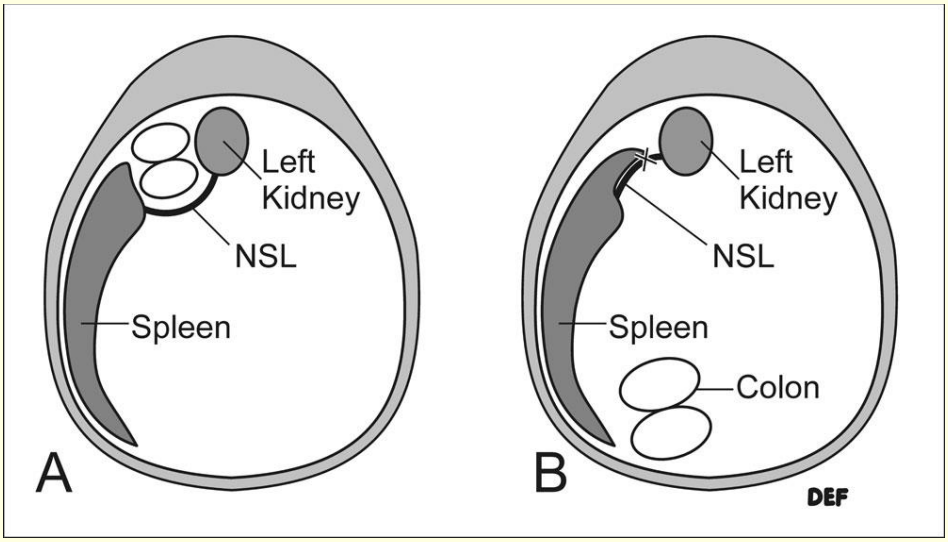
Question

While performing an ultrasound of a colic case it is noted that the ultrasonagrapher is unable to visualize the left kidney. What is the tentative diagnosis?

- Ascarid impaction

- Nephrosplenic entrapment
- Strangulating lipoma
- Cecal impaction

Explanation - The correct answer is nephrosplenic entrapment. The kidney is obscured as a result of a left dorsal displacement of the large colon over the nephrosplenic ligament. Large horses may be predisposed to this.



Question

A 24-year old Appaloosa has an increased heart rate, increased respiratory rate, and is pacing while staring at her abdomen. During initial colic work up there was no gastric reflux. On rectal exam, a distended large colon could be palpated. On abdominal ultrasound, large colon was the predominant structure visualized on the left side while the left kidney could not be visualized via ultrasonography. What is the most likely diagnosis?

- Strangulating lipoma
- Right dorsal displacement
- Sand impaction
- Nephrosplenic entrapment

Explanation - The correct answer is nephrosplenic entrapment. The kidney is obscured as a result of a left dorsal displacement of the large colon over the nephrosplenic ligament. Additionally, the spleen is pushed away from the body wall, making it difficult to see on ultrasound. Large horses may be predisposed to this. Besides surgical correction, one may try to roll the horse 360 degrees. Pain associated with these types of displacements are usually mild to moderate.

Question

You are asked to perform a necropsy on a 17-year old Standardbred mare on a large horse ranch. Although not related to the cause of death, you notice the parasite shown in the image within the stomach. You tell the owner that this parasite is also responsible for the eggs that he sees seasonally on the hair of the front legs of his horses. The owner asks what should be done about this. You discuss the importance of promptly cleaning up feces and transporting feces away. In addition, which of the following is the most appropriate recommendation for ongoing control of this parasite?

- There is no need to treat these parasites because they are not associated with disease in horses
- Administer ivermectin twice annually, once in the early summer and again in the fall
- Administer ivermectin twice annually, once in the early spring and again in the winter
- Administer moxidectin twice annually, once in the early summer and again in late summer
- Administer moxidectin twice annually, once in the early spring and again in the fall

Explanation - This case describes the appearance of the horse bot fly, Gasterophilus spp. Gasterophilus is frequently asymptomatic but treatment is recommended because adult bots can cause gastritis and frequently are a source of annoyance and stress to horses. In addition, the larval instars can cause stomatitis, and colic.

The recommended management protocol is typically to treat with an avermectin to control adults and all larval stages by administering in the early summer, shortly after any eggs are seen and again in the fall at the end of the botfly season. Such a control program will substantially reduce fly numbers.

Question

On which side do horse teeth need to be floated?

- Mandible buccal and maxilla lingual
- Maxilla lingual and mandible lingual
- Maxilla buccal and mandible lingual
- Maxilla buccal and mandible buccal

Explanation - The correct answer is maxilla buccal and mandible lingual. This is because the mandible is narrower than the maxilla thus predisposing points and hooks to form at the buccal surface of the maxilla and the lingual surface of the mandible. If these become sharp they can irritate tissues, cause difficulty in mastication, lacerate the tongue and cheek, and result in weight loss.

Question

You are examining a 6-year old Thoroughbred gelding for acute onset of diarrhea on a warm summer day. Upon physical examination, tachycardia and fever are present along with severe diarrhea. You also notice signs of lameness in the front feet suggestive of laminitis. What is a cause of diarrhea that is seasonal and is associated commonly with laminitis?

- Corynebacterium pseudotuberculosis
- Neorickettsia risticii (Potomac Horse Fever)
- Clostridium sordellii
- Salmonella typhimurium

Explanation - Neorickettsia risticii commonly causes diarrhea in the warmer summer months and is observed in horses stabled near bodies of water. Although a trematode vector is suspected, the exact pathogenesis remains an area of study. The treatment is oxytetracycline. While many causes of diarrhea can result in laminitis, PHF has been associated with laminitis frequently. Salmonella can also result in the clinical signs noted but is not restricted by season.

Question

A 13-year old Hanoverian brood mare presents for an acute onset of lethargy, anorexia, and explosive, watery, diarrhea. The diarrhea began approximately 14 hours after the initial signs of anorexia and lethargy. Clinicopathologic findings include neutropenia 2300/ul (normal 2,900-8,500/ul) with toxic neutrophils along with the typical electrolyte abnormalities seen with diarrhea Sodium 115 mEq/L (128-142 mEq/L) and Chloride 83 mEq/L (98-109 mEq/L). Which of the following pathogens is most commonly known for being able to cause a presentation such as the one described in this horse?

- Strongyloides westeri
- Ehrlichia equi (Anaplasma phagocytophilia)
- Parascaris equorum
- Salmonella

Explanation - The correct answer is Salmonella. Salmonella can cause several different clinical presentations including subclinical infection, self-limiting diarrhea, and acute diarrhea with endotoxemia.

Parascaris equorum and Strongyloides westeri are both parasites that may cause diarrhea. Parascaris equorum infestations may result in lethargy, depression, and respiratory signs. Occasionally, they result in intestinal obstruction and subsequent perforation. Strongyloides westeri is associated with diarrhea in foals and not in adult horses. Mares usually harbor this organism in their tissues and then transmit the parasite in the milk, thus infecting foals. Ivermectin administered to the mare will usually kill any Strongyloides westeri harbored by the mare.

Clinical signs of Ehrlichia equi include lethargy, anorexia, fever, limb edema and hematology changes such as neutropenia and thrombocytopenia. One might confuse Ehrlichia equi with Ehrlichia risticii (Neorickettsia risticii), the later causing lethargy, anorexia, fever, diarrhea, and laminitis. However, keep in mind that less than 60% of horses with Potomac Horse Fever develop diarrhea.

Diagnosis of E. risticii requires measurement of paired serum titer via immuno-fluorescent antibodies or detection of the organism via PCR in the blood or feces. Diagnosis of Salmonella requires serial cultures of feces for 3-5 days. Diagnosis of Strongyloides westeri and Parascaris equorum is by demonstration of eggs in the feces.

Question

An adult horse develops acute depression and a high fever (106F). The horse develops watery diarrhea and is brought to see you. When you examine the horse, it is still febrile and has now developed laminitis as well as the other signs. You perform bloodwork and find the horse to be leukopenic (WBC-4,000/uL) with a monocytosis (monocytes-1,500/uL). What is your top differential?

- Neorickettsia risticii
- Salmonella typhimurium
- Clostridium perfringens type A
- Cantharidin toxicity (Blister beetle)

Explanation - The correct answer is Neorickettsia risticii (previously known as Ehrlichia risticii). This is the causative agent of Potomac horse fever (PHF) and fits best with all the signs and findings described in this

question, although the other choices are reasonable differentials as well. Unfortunately, this is the way many board exam questions will be structured. The factors that make Neorickettsia risticii the best answer are the high fever and monocytosis, which you would not expect with the other conditions.

Salmonella could cause similar signs, but there is a higher incidence of laminitis with PHF.
Clostridial diarrhea is often more peracute and severe, and there is hemoconcentration (PCV of 65% or higher).
Blister beetle toxicity (Cantharidin) is also commonly more peracute, and you would expect to see some other signs such as hematuria.
Potomac Horse Fever (Seasonality in warmer months + Monocytosis + Laminitis)

Question
In horses, which of the following pathogens most commonly requires paired serum titers to obtain a presumptive diagnosis?

- Clostridium difficile
- Large strongyles
- Salmonella
- Neorickettsia risticii

Explanation - The correct answer is Neorickettsia risticii (previously called Ehrlichia risticii), the causative agent of Potomac Horse Fever (PHF). Diagnosis of N. risticii is based on a four-fold rise in paired IFA titers or on a decrease in the titer between the acute and convalescent serum samples. More recently, detection of the organism via PCR has become available providing higher sensitivity and specificity in the diagnosis of PHF. Clinical signs of Potomac Horse Fever include anorexia, fever, lethargy, ileus, colic, diarrhea, and laminitis. Diarrhea is seen in less than 40% of cases.

Salmonella is most commonly diagnosed by performing fecal cultures.
Clostridium difficile diagnosis usually involves an ELISA searching for toxin A and toxin B.
Large strongyles are diagnosed by demonstration of eggs in fecal material.

Question

A horse presented to you for severe colic. At surgery, you note infarction of a mesenteric artery. What organism is associated with this lesion?

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

Explanation - The correct answer is Strongylus vulgaris. Migration of the larvae of Strongylus vulgaris and the corresponding immune response can result in thrombosis of the cranial or anterior mesenteric arteries leading to colic and infarction of the bowel. Parascaris equorum causes colic in foals by causing intestinal impaction. Strongyloides westeri is a cause of foal heat diarrhea and can migrate through the lung causing damage. Dictyocaulus is a lungworm.

Question

A 2-day old white foal presents for colic. The foal was normal at birth and is the progeny of 2 valuable Overo horses. What should you suspect?

- Meconium impaction
- Ileocolonic agangliosis
- Uroperitoneum
- Atresia ani

Explanation - The correct answer is ileocolonic agangliosis. The other name for this condition is lethal white foal syndrome. This is an autosomal recessive trait seen in Overo horses. The foals are white with blue irises. Diagnosis is confirmed by histopathology showing a lack of ganglia in the colon. Most develop colic and die by 2 days of age.

Question

An 8-day old foal presents for diarrhea. What is the most likely cause?

- Cryptosporidium
- Foal heat diarrhea
- Strongylus vulgaris
- Strongyloides westeri

Explanation - The correct answer is foal heat diarrhea. The exact cause of this is unknown and is termed foal heat diarrhea because of the relationship to the occurrence of post foaling estrous in the mare. However, we don't believe it is caused by estrous. It is possible that consumption of grain and hay may play a role in altering the gastrointestinal flora such that diarrhea develops. Foal heat will occur at 7-14 days of age. S. vulgaris and S. westeri will usually cause diarrhea later on in life due to their life cycles. Cryptosporidium may be a cause of diarrhea, but it is also found in healthy foals.

Question

A 5-year old female Quarterhorse has been tentatively diagnosed with duodenitis-proximal jejunitis (DPJ). What other cause of equine colic can DPJ closely resemble?

- Small intestinal obstruction
- Nephrosplenic entrapment
- Ascarid impaction
- Salmonella

Explanation - The correct answer is small intestinal obstruction. Both small intestinal obstruction and duodenitis-proximal jejunitis (DPJ) present with similar clinical signs. The problem is that a small intestinal obstruction will be a surgical disease, and duodenitis-proximal jejunitis responds better to medical treatment. The cause of duodenitis-proximal jejunitis remains unknown. Clinical signs include acute colic with increased respiratory rate, heart rate, and pain. Additionally, there will be lots of gastric reflux. After decompression of the stomach via nasogastric intubation and removal of excess gastric/intestinal fluid, horses with DPJ may appear much more comfortable.

Question

You are treating a colicky 8-year old horse and pass a stomach tube to assess gastric reflux. The 20 liters of reflux is hemorrhagic, orange-brown in color, and foul-smelling. On physical exam, you find T=101.5F, HR=70, and RR=35 and overall depressed attitude. There are few auscultable gut sounds. Oral mucous membranes are injected. On rectal exam, there are multiple dilated fluid-filled loops of bowel palpated. Peritoneal fluid is serosanguinous with a 3.5 gm/dl protein and a WBC count of 7000. After decompressing the stomach, the horse appears less painful, but remains depressed. Based on these findings, what is the best tentative diagnosis?

- Duodenitis-proximal jejunitis
- Impaction colic (large bowel impaction)
- Verminous arteritis caused by strongylus vulgaris
- Large bowel torsion
- Acute small intestinal obstruction

Explanation - Duodenitis-proximal jejunitis, also known as either anterior enteritis, or proximal enteritis best fits this case because of the **characteristic reflux**, fever, peritoneal fluid characteristics, rectal findings (palpation of multiple dilated fluid-filled loops of bowel), the depression and relatively less pain than would be expected with an obstruction. The cause is still uncertain, but a relationship of this disease to positive cultures of reflux for Clostridium difficile has been found. Typically these cases are treated medically, which would include repeated decompression of the stomach, IV fluids, replacement of electrolyte deficiencies, analgesics and correction of any acid-base abnormalities.

Question

A 16-year old pregnant Standardbred mare presents with an acute onset of colic. On presentation, she has a heart rate of 64, respiratory rate of 32, and is pawing. CRT is approximately 3.0 seconds, and mucous membranes are red. Her rectal temperature is 101.3F. Gastrointestinal sounds are completely absent, and gastric reflux yielded 16L of brown- to yellow-colored fluid. Which of the following is a possible diagnosis?

- Cecal impaction
- Nephrosplenic entrapment
- Mesenteric rent
- Left dorsal colon displacement
- Right dorsal colon displacement

Explanation - The correct answer is a mesenteric rent. A mesenteric rent can result in a strangulating intestinal obstruction. Other causes of strangulating intestinal obstructions include intussusceptions, hernias, epiploic foramen incarceration, volvulus, and strangulating lipomas. Left dorsal colon displacement is the same thing as splenic entrapment and will typically not result in a colic presentation this severe.

Question

A 28 year old Paint stallion presents with an acute onset of colic. On presentation he has a rectal temperature of 99.8F, heart rate of 75 beats/min, respiratory rate of 24 breaths/min, and is pawing and trying to lie down. CRT is approximately 3.0 seconds, and mucous membranes are purple-red. Gastrointestinal sounds are completely absent, and gastric reflux yielded 18L of brown- to yellow-colored fluid. Peritoneal fluid analysis

yielded a cloudy yellow fluid with a protein of 3.2 gm/dl and white blood cell count of 11,000/ul. Which of the following is a possible diagnosis?

- Strangulating lipoma
- Cecal volvulus
- Strongylus vulgaris infestation
- Left dorsal colon displacement
- Right dorsal colon displacement

Explanation - The correct answer is strangulating lipoma. Lipomas are a common cause of small intestinal obstruction in older horses. Typically, a section of the small intestine becomes intertwined with a pedunculated lipoma, resulting in obstruction and possible devitalization of the small intestine. Surgical correction is necessary to correct this problem. None of the other answer choices typically result in the clinical signs described, particularly gastric reflux. Left dorsal colon displacement typically have milder clinical signs, and the diagnosis can be made by rectal palpation and ultrasonography.

Question

A 14-year old 500 kg multiparous mare presents for a 3 hour history of moderate to severe colic. Her current foal is 2 weeks of age. Upon physical examination the mare is uncomfortable with a heart rate of 70 beats/min, respiratory rate of 16 breaths/min and rectal temperature of 98.4F. A nasogastric tube is placed with no net gastric reflux obtained. A large gas filled section of intestine is noted on rectal examination. You administer 5 mg of detomidine IV which provides only brief sedation. Based on this limited information, what is the most likely cause of these clinical signs?

- Hemorrhage from rupture of the uterine artery post-foaling
- Large colon volvulus
- Small intestinal strangulation
- Large colon impaction
- Small intestinal entrapment within the epiploic foramen

Explanation - The correct answer is large colon volvulus. Typically, horses with this problem demonstrate rapid onset of severe unrelenting pain and often occurs in postpartum broodmares. Gas distension of the colon may be significant and result in respiratory compromise because the distended colon presses on the diaphragm. Gastric reflux may not be present as the small intestine may not be obstructed in this process.

This is a surgical emergency; if surgery or necropsy is performed, the volvulus is typically located at the mesenteric attachment of the colon to the dorsal body wall. Because of the rapid onset, the prognosis is guarded to poor in many cases.

Question

The lesion associated with this horse's source of colic is pictured below. The lesion causing the pathology seen in the intestine has been separated and is seen to the left of the image. What is the most common signalment for this cause of colic.

- Mid- to older (15-20 years of age) geldings
- Horses less than 1 year of age
- Any age stallions
- Adolescent (3-5 years of age) mares

Explanation - You must first identify the cause of colic as being a strangulating lipoma. The lipoma is to the left and has been untangled from the intestine where it was strangulating part of the small intestine (notice the normal colored small intestinal serosa as compared to the dark purple section). There is a strong association with strangulating lipomas occurring in older horses, especially geldings. Thus, mid-to older age geldings is the best answer.

Question

A 21-year old Standardbred mare presents for acute onset of colic. At surgery, you detect the abnormality seen in the picture. What has occurred to this mare?

- She has enterolithiasis
- She has an epiploic foramen entrapment
- She has a nephrosplenic entrapment
- She has a strangulating lipoma

Explanation - The yellow mass in the image is a mesenteric lipoma. It has encircled a region of bowel and mesentery, evident by the annular ring at the base of the mass surrounding the intestines. This is a cause of colic in older horses due to acute ischemia and resultant necrosis of the bowel.

Question

An 8-year old Quarterhorse brood mare presents with an acute onset of colic. On presentation she has a heart rate of 58, respiratory rate of 28, and is seen rolling on the ground. CRT is approximately 3.0 seconds and mucous membranes are slightly red. She has rectal temperature is 101.6F. Gastrointestinal sounds are completely absent and gastric reflux yielded 15L of brown- to yellow- colored fluid. Peritoneal fluid analysis yielded a cloudy yellow fluid with a protein of 2.8 gm/dl and white blood cell count of 11,354/ul. Which of the following is NOT a likely diagnosis?

- Mesenteric rent
- Strangulating lipoma
- Epiploic foramen entrapment
- Small intestinal volvulus

Explanation - The correct answer is strangulating lipoma. The clinical signs are consistent with any of the answer choices. However, a strangulating lipoma is least likely to be the case since this horse is still relatively young. Strangulating lipomas are commonly seen in older horses.

Question

A 7-year old male Thoroughbred presents with a history of colic, increased heart rate, and increased respiratory rate. On physical exam, there is no reflux; on rectal exam, the colon is palpable between the cecum and body wall. What is the diagnosis?

- Right dorsal colon displacement
- Cecal volvulus
- Left dorsal colon displacement
- Strangulating lipoma

Explanation - The correct answer is right dorsal colon displacement. The rectal exam findings are characteristic for a right dorsal colon displacement. You can sort of figure out the answer even if you know

nothing about horses, just think anatomy. The cecum is on the right side... so there is probably something going on in the right side. A left dorsal displacement is the same thing as a nephrosplenic entrapment. In this case, the colon becomes trapped in the renosplenic space. A primary cecal volvulus is rare in horses and are usually seen secondary to a large colon volvulus. These horses will ping similarly to a cow and usually present with acute colic. A strangulating lipoma is highly unlikely, given the age of the horse and lack of gastric reflux. Additionally, these tend to strangulate small intestines, not the colon.

Question

12 L of gastric reflux with a pH of 6.5 in a horse is most indicative of which of the following?

- Normal finding
- Colon displacement
- Obstruction
- Gastric ulceration

Explanation - The correct answer is obstruction. A pH that is greater than 5 suggests that small intestinal contents are refluxing into the stomach, resulting in an increased pH. Small intestinal ileus is another differential but was not an answer choice.

Question

Which of the following larvae is known to migrate through the portal vein and into the liver of a horse?

- Strongylus vulgaris and Strongylus equinus
- Strongylus edentatus and Strongylus equinus
- Strongylus edentatus and Strongylus vulgaris
- Anoplocephala perfoliata and Strongylus vulgaris

Explanation - The correct answer is Strongylus edentatus and Strongylus equinus. The L3 larvae migrate through the portal vein and into the liver, through the peritoneum and retroperitoneal space. After a few months, the larvae will then return into the lumen of the gut. Strongylus vulgaris will migrate through small vessels and into the cranial mesenteric artery. Anoplocephala perfoliata is a tapeworm and does not migrate through blood vessels.

Question

Horses are predisposed to developing enteroliths in California. What food item is considered to be playing a role in the formation of enteroliths?

- Oat hay

- Alfalfa hay
- Sweet feed
- Grass hay

Explanation - The correct answer is alfalfa hay. Alfalfa hay in California is thought to be particularly high in magnesium. This may be a predisposing factor which results in magnesium ammonium phosphate enteroliths.

Question

A 1.5 year old Hanoverian gelding presents for colic. He was dewormed yesterday with piperazine, and now he is behaving colicky. He also had a previous history of intermittent diarrhea. What is likely to have occurred that resulted in colic?

- Adverse reaction to piperazine in Hanoverians
- Large die-off of ascarids resulting in impaction
- Infarction of the caudal mesenteric artery
- Small bowel bacterial overgrowth

Explanation - The correct answer is large die-off of ascarids resulting in impactions. Treatment with piperazine will result in rapid death of ascarids. If a horse has a large burden of worms, this may be contraindicated as they may die rapidly and result in obstruction, as most likely occurred in this case. There is no reported specific adverse reaction of piperazine in Hanoverian horses. Small bowel bacterial overgrowth is not an issue. This would not happen after treatment with piperazine, especially a day after treatment. Infarction of the caudal mesenteric artery is not seen with use of piperazine.

Question

During a routine pre-purchase exam of a 5-year old Thoroughbred, many yellowish eggs are noted on the medial aspect of the cannon bone. Given the location of these eggs, what is the most likely diagnosis?

- Pinworm eggs
- Horse bot eggs
- Stomach worm eggs
- Flea eggs

Explanation - The correct answer is horse bot eggs. Horse bots (Gasterophilus spp.) can lay their eggs anywhere. However, Gasterophilus intestinalis, which is the common bot, typically will lay their yellowish eggs on the medial aspect of the forelimb cannon bones.

Question

A 10-day old, 130 pound thoroughbred colt is presented to you for a 2-day history of watery diarrhea. The foal gestational period was 327 days with a normal parturition reported. Serum IgG concentration, measured at 1 day of age, was 550 mg/dL. The foal produces watery diarrhea during the examination (see image) and nurses once per hour. The colt appears dull but responsive. The vital parameters taken as the foal rests are as follows:

Temperature 102.9F
Pulse 120 beats/min
Respiratory Rate 80 breaths/min

Based on the limited information presented here, what is the LEAST likely cause of the diarrhea noted in this case?

- Septicemia
- Rotavirus
- Salmonella sp.
- Clostridium perfringens
- Foal Heat Diarrhea

Explanation - Based on the more concerning clinical signs, foal heat diarrhea is the least likely cause. Foal heat diarrhea is associated with the mare's first estrous cycle after parturition, typically occurring between 8-12 days after parturition. Almost always, foal heat diarrhea is transient and not associated with clinical signs (ie. lethargy, inappetance, fever); it is also self-limiting. The cause of foal heat diarrhea is not exactly known, but hormonal changes, diet changes and/or intestinal floral changes are some possible causes. The other possible answers are all causes of diarrhea in the foal and can be associated with significant clinical signs and changes in blood parameters (CBC, biochemistry profile).

This case also tests your knowledge of healthy foals. Some things to recognize in this question include: the gestation length is slightly short (normal gestational period ~ 340 days), the serum IgG is low (normal IgG > 800 mg/dL), the nursing activity is decreased (normally nurse 4-6 times/hour) and the colt has mild elevations in temperature, pulse and respiratory rate.

Question

You are presented with a 6-month old colt with a 5-day history of lethargy, intermittent diarrhea, weight loss, and ventral edema. A quick check of the PCV and TP reveal a PCV of 30% (28-42%) and TP of 3.2 g/dl (6.8-8.2 g/dl). Abdominal ultrasound (see image) demonstrates thickening of the small intestinal wall. What is the most likely diagnosis based on signalment, history and clinical findings?

- Intermittent jejunal intussusception
- Clostridium difficile enteritis
- Salmonella infection
- Lawsonia intracellularis infection

Explanation - Although not as commonly as in pigs, L. intracellularis can infect horses (and other species). Similar to pigs, the infection usually involves weanling age horses and causes thickening of the small intestine and hypoproteinemia. The low protein is commonly observed as ventral edema clinically. Both Clostridium and Salmonella can cause diarrhea at any age but are not as commonly associated with **ventral edema**. Intussusceptions do occur but also typically result in colic.

Question

A 9-day old foal is experiencing mild diarrhea. What is the most likely diagnosis?

- Lactose intolerance
- Clostridium perfringens
- Foal heat diarrhea
- Rhodococcus equi

Explanation - The correct answer is foal heat diarrhea. Although any of these answers could be correct, sometimes this is all you have to go on for some exam questions. To answer this question you need to know at what time periods foals get what diarrhea and the severity.

Foal heat diarrhea is mainly seen at the age of 7-14 days and is usually very mild in nature, making this the best answer choice.

Rhodococcus equi will result in diarrhea in foals that are between the ages of 1-4 months; however, remember that this organism primarily causes respiratory disease, so look for that too.

Clostridium perfringens Types A, B, and C will usually result in an acute to peracute diarrhea in foals, leaving most of them dead in 48 hours if treatment is not instituted.

Primary lactose intolerance is rare in foals.

Question

Gasterophilus in horses causes which of the following clinical signs?

- Diarrhea
- Anemia

- Vomiting
- Dermatitis
- Gastritis

Explanation - The correct answer is gastritis. The larvae of Gasterophilus embed themselves in the mucosa of the stomach and can cause a mild gastritis or no clinical signs. The eggs are laid on the hairs of the horse but do not typically cause dermatitis. They do not develop diarrhea from these infections and horses do not vomit. Anemia does not occur with Gasterophilus infections.

Question

The syndrome of right dorsal colitis in horses is associated with which predisposing factor?

- Parasitic damage of the intestinal arteries (i.e. right colic artery)
- Administration of non-steroidal anti-inflammatory drugs (i.e. phenylbutazone)
- Colitis as a result of Salmonella infection
- Administration of beta-lactam antimicrobials at excessive dosages (i.e. Ceftiofur)

Explanation - Right dorsal colitis is associated with the administration of NSAIDs. The dose of NSAIDs may be within the normal range or higher than recommended dosages. This disease is also usually associated with more chronic administration of NSAIDs (>1 week). Some horses may be more sensitive to NSAIDs, with clinical signs such as inappetence, intermittent colic, and hypoproteinemia commonly observed.

Question

A 14-year old Saddle-bred mare presents with acute clinical signs of mild to moderate colic, inappetance and lethargy. The heart rate, respiratory rate and temperature at presentation are 80 beats per min, 36 breaths per min and 103.2F, respectively; rectal palpation reveals the colon is edematous. Relevant CBC abnormalities include:

WBC: 1.56 x 10,000/mcL (reference 5.0-11 x 10,000/mcL)
HCT: 53% (reference 34-45%)
Neutrophil 0.20 x 10,000/mcL (reference 2.2-6.5 x 10,000/mcL)
Lymphocyte 1.03 x 10,000/mcL (reference 1.3-4.5 x 10,000/mcL)
Fibrinogen 700 mg/dL (reference 100-400 mg/dL)

What is the most likely cause of the clinical signs and clinicopathologic derangement?

- Left Dorsal Colitis
- Right Dorsal Displacement of the Colon
- Diaphragmatic Hernia with small intestinal displacement into the thoracic cavity

- Colitis X
- Pleuropneumonia

Explanation - The most likely cause is Colitis X which is an all-encompassing term used for acute colitis in the horse. Colitis may be associated with endotoxemia with clinical signs ranging from severe pain, abdominal distention and fever to collapse and signs of shock. Severe diarrhea may be present or the horse may not be producing much feces at all.

The tachycardia, tachypnea and fever in this horse is likely associated with pain, endotoxemia and dehydration. Some causes of colitis X would include Salmonella, Potomac Horse Fever, and Clostridium. Typically horses with pleuropneumonia do not present with signs of colic, and diaphragmatic hernias typically do not have clinical signs and CBC findings suggestive of endotoxemia unless a piece of small intestine is devitalized through the hernia.

Question

Horses living in a sandy region such as California and Florida tend to be predisposed to developing sand enteropathies. If one is suspected, which of the following treatments will be most effective?

- Bismuth subsalicylate
- Mineral oil
- Psyllium
- Charcoal

Explanation - The correct answer is psyllium. Psyllium is a hemicellulose laxative that has the ability to bind with sand and help remove it from the gastrointestinal tract. Feeding the horse in a stall and/or utilizing hay racks will also help the inadvertent consumption of sand that may be ingested if a horse is eating on sandy ground. None of the other answer choices are as effective as psyllium.

Question

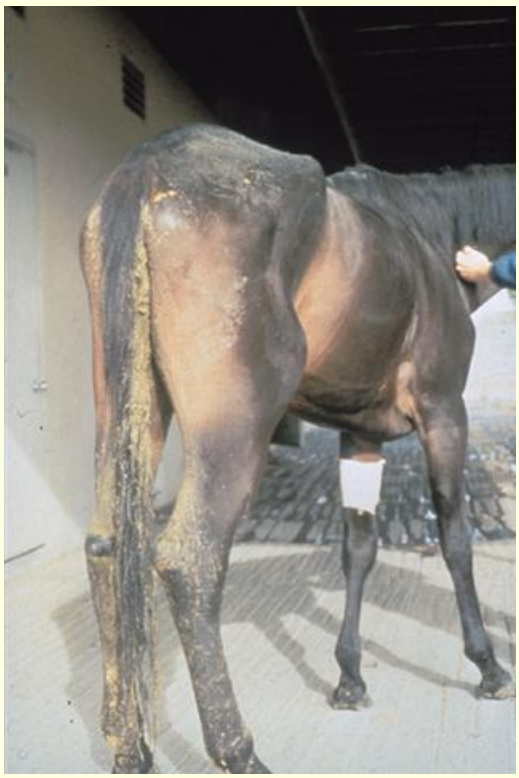
You are called over the truck radio to see a 4-year old horse that is salivating and has feed coming out its nose (see photo). He is being fed a diet of alfalfa cubes and 3 lbs of oats per day and was last fed about 5 hours ago. On PE you find T=101, HR=65, RR=30, and the horse is anxious and difficult to examine due to its apparent discomfort. You believe that the horse is probably choked. What is the first step in appropriate treatment?

- Anesthetize the horse and incise over the esophageal obstruction to remove it immediately, then give large amounts of a broad spectrum antibiotic
- Anesthetize the horse and vigorously flush out the offending material
- Pass a stomach tube and attempt to gently push the bolus aborally
- Flush the esophagus vigorously with mineral oil
- Sedate the horse with xylazine and give repeated large doses of atropine to stop the salivation

Explanation - The main thing to remember when treating a choked horse is that you have time to resolve this without taking immediate drastic action. Most resolve in 12 to 24 hours if put into a stall with no bedding, water or feed and left alone. The main complication can be inhalation (foreign body) pneumonia. If the horse has choked on a caustic substance, rupture of the esophagus may occur days later, but this is rare with nothing more than feed involved.

Question

A valuable horse suddenly developed severe intractable diarrhea and fever 5 days ago. The owner has been giving it oral electrolytes free choice in the water, and offering it hay, grain, and green grass. It is brought to your clinic on a normal warm summer day looking thin, dehydrated, weak, and anorectic (see photo). You do a physical exam and find T=102F, HR=56, RR=24, with somewhat purplish oral mucous membranes. The urine is normal but has a small volume and looks concentrated. You run a PCV (45%), WBC count (normal at 7000/microliter) and total protein (TP). The TP is low at 3.5 gm/dL and the albumin is 1.4 gm/dL indicating a protein-losing enteropathy. Of the following, what is the best treatment for the low plasma proteins in this horse?



- IV amino acids
- Feed very high protein diet with added amino acids
- Oral albumin
- Whole blood IV
- IV plasma

Explanation - The damaged bowel is leaking albumin out into the gut lumen, and the horse may develop other problems such as edema and poor healing ability if the protein levels are not boosted. The best way to do that in an animal with GI disease is by the IV route. Whole blood may raise the PCV to a level where sludging and circulatory problems develop in an already dehydrated horse. Another option to consider if plasma is not readily available is the use of synthetic colloidal solutions such as hetastarch.

Question

A 2-month-old Thoroughbred foal presents with the onset of profuse watery diarrhea and you suspect salmonellosis (see image). There are three specific diagnostic parameters that you, as the clinician, must assess to determine whether or not this patient should be confined to isolation. What are the three diagnostic parameters?

- Diarrhea, fever, and neutropenia. All 3 of the diagnostic parameters must be present to qualify for isolation.
- There are no specific diagnostic parameters for isolation qualification. Any foal or horse with diarrhea should be admitted to isolation.
- Diarrhea, fever, and neutrophilia. All 3 of the diagnostic parameters must be present to qualify for isolation.
- Diarrhea, fever, and neutropenia. Any 2 of the 3 diagnostic parameters qualify for isolation
- Diarrhea, fever, and neutrophilia. Any 2 of the 3 diagnostic parameters qualify for isolation.

Explanation - The correct answer is diarrhea, fever, and neutropenia. Any 2 of these 3 parameters meet the criteria to admit any equine patient into isolation. The most likely cause of the neutropenia is bacterial septicemia and endotoxemia due to gastrointestinal disease. Other common diseases that can cause a neutropenia are metritis and coliform mastitis.

Question

An owner requests that a horse be aged. On oral exam, it is apparent that the canine teeth are beginning to erupt. What is the approximate age of this horse?

- 1 year
- 3 years
- 2 years
- 4 years

Explanation - The correct answer is 4 years. The canine teeth erupt at 4-5 years of age in the horse. It is helpful to remember 2 1/2, 3 1/2, 4 1/2 and then canine. That is...incisors 1, incisors 2, incisors 3, and then the canines will erupt respectively.

Question

Which of the following treatments is contraindicated in the treatment of choke?

- Lidocaine
- Flunixin meglumine
- Mineral oil
- Xylazine

Explanation - The correct answer is mineral oil. In horses, choke is caused by an obstruction in the esophagus. If mineral oil is used to relieve the obstruction, there is a risk of aspiration pneumonia. Aspiration of mineral oil is particularly harsh. Xylazine is commonly used to sedate the horse in order to pass a tube and then gently flush the esophagus with water. Lidocaine is given to help relieve discomfort and flunixin meglumine is given as a non-steroidal anti-inflammatory. If the choke does not resolve on your first try, give the horse 12-24 hours and maybe some IV fluids; then try again if necessary. This usually does the trick as long as you are not dealing with an anatomical choke (esophageal diverticulum) or a very severe case.

Question

A Paint horse mare gives birth to an all-white foal (see image). What clinical sign would you expect to see in a foal with lethal white syndrome?

- Ataxia
- Regurgitation
- Constipation
- Anhydrosis

Explanation - The correct answer is constipation. Lethal white foals have aganglionosis of the intestines which leads to hypomotility, megacolon, constipation, colic, and death.

Question

Which of the following tapeworms is not found in horses?

- Dipylidium spp.
- Paranoplocephala mamillana
- Anoplocephala perfoliata
- Anoplocephala magna

Explanation - The correct answer is Dipylidium spp. Dipylidium tapeworms are found in cats and dogs. The other three tapeworm species can occur in horses. Clinical signs include unthriftiness, anemia, and colic. Infections can be treated with praziquantel. Pyrantel salts are only effective against Anoplocephala spp., but not P. mamillana.

Question

Clostridium difficile is a spore-forming bacteria commonly associated with enterocolitis and diarrhea in adult horses and foals. Which of the following statements is NOT correct in regard to C. difficile in horses?

- Administration of non-steroidal anti-inflammatory medications. For example flunixin meglumine, is a risk factor for the development of C. difficile enterocolitis.
- Transmission of C. difficile occurs via the oral-fecal route.
- C. difficile is a Gram-positive, rod shaped, obligate anaerobe.
- C. difficile can survive for prolonged periods of time in the spore form.
- The 2 main virulence toxins are toxin A and toxin B.

Explanation - The correct answer is NSAID treatment is a risk factor for the development of C. difficile enterocolitis. Remember all the other answers are correct, so hopefully you can take away some of these important facts from this question. Risk factors for the development of disease include antibiotic treatment and hospitalization, but does not include administration of NSAIDs.

Question

A one-month old foal develops fever, icterus, and diarrhea acutely. Bloodwork shows hyperfibrinogenemia, hypoglycemia, and elevated liver enzymes. Which of these conditions is most likely?

- Theiler's disease
- Herpesviral hepatitis
- Clostridium novyi type B
- Tyzzer's disease

Explanation - The correct answer is Tyzzer's disease. This is the most likely cause because of the age of the foal and the acute nature of the disease. Tyzzer's disease is caused by Clostridium piliformis, which causes an acute necrotizing hepatitis. It affects **only** foals from about 1-6 weeks of age. Theiler's disease is a condition of adult horses. Clostridium novyi is rare in horses and seen much more in sheep and cattle. Herpesvirus can cause hepatitis but is usually seen at or very soon after birth.

Question

While on a routine call for teeth floats, you notice that there is a significant amount of fiddleneck in the horse pasture. What are the histopathologic findings that are associated with consumption of this plant?

- Megalocytes, fibrosis, and biliary hypoplasia of the liver
- Megalocytes, hepatic lipidosis, and biliary hypoplasia of the liver
- Nigropallidal encephalomalacia of the brain
- Megalocytosis, fibrosis, and biliary hyperplasia of the liver

Explanation - The correct answer is megalocytosis, fibrosis, and biliary hyperplasia of the liver. Fiddleneck (Amsinckia intermedius) is a **pyrrolizidine alkaloid**. Nigropallidal encephalomalacia is seen as a result of consuming yellow star thistle.

Question

You suspect liver failure in a sick horse. You perform a liver biopsy which shows histopathological changes of megalocytosis, periportal fibrosis, and biliary hyperplasia. What most likely caused the liver failure?

- Tyzzer's disease
- Theiler's disease
- Copper toxicity
- Pyrrolizidine alkaloid toxicity
- Chronic active hepatitis

Explanation - The correct answer is pyrrolizidine alkaloid toxicity. The three histopathologic changes described are the classic changes seen with pyrrolizidine alkaloid toxicity. With Tyzzer's disease, you would see randomly distributed foci of necrosis and long slender rods in hepatocytes at the periphery of the necrotic foci. With chronic active hepatitis, histopathologic changes would be hepatocyte damage, variable fibrosis, inflammatory infiltration, and evidence of biliary hyperplasia with bile stasis.

Question

Which of these is most likely to cause Theiler's disease?

- Aflatoxin
- Pyrrolizidine alkaloids
- Tetanus antitoxin
- Bacillus piliformis (Clostridium piliformis)

Explanation - The correct answer is tetanus antitoxin. Theiler's disease, or serum hepatitis, is an acute, diffuse, necrotizing hepatitis that occurs most commonly in association with introduction of an equine origin compound. The most commonly implicated product is tetanus antitoxin, which is an antiserum of equine origin. The disease usually occurs 4-10 weeks after administration and presents as malaise and weight loss, progressing to acute hepatoencephalopathy and icterus, and can be rapidly progressive and fatal. Pyrrolizidine alkaloids can also cause similar clinical signs but are distinguishable pathologically by the presence of the histologic triad of megalocytosis, fibrosis, and bile duct proliferation. Bacillus or Clostridium piliformis is the cause of Tyzzer's disease; this is a hepatopathy seen usually in foals. Aflatoxins can also be hepatotoxic.

Question

Which of the following causes liver failure when ingested by horses?

- Fiddleneck
- Astragalus
- Bracken fern
- Oleander

Explanation - The correct answer is fiddleneck. Fiddlenecks contain pyrrolizidine alkaloids as does groundsel, ragwort, and senecios. Pyrrolizidine alkaloids cause secondary photosensitization as well as hepatic damage that are cumulative and progressive. Treatment consists of supportive care for liver failure and prognosis is poor.

Question

Acute serum hepatitis in horses, also known as Theiler's Disease, results in acute clinical signs of lethargy, anorexia, icterus, and hepatoencephalopathy. The diagnosis can be established upon examination of a liver biopsy that would reveal which histopathologic finding(s)?

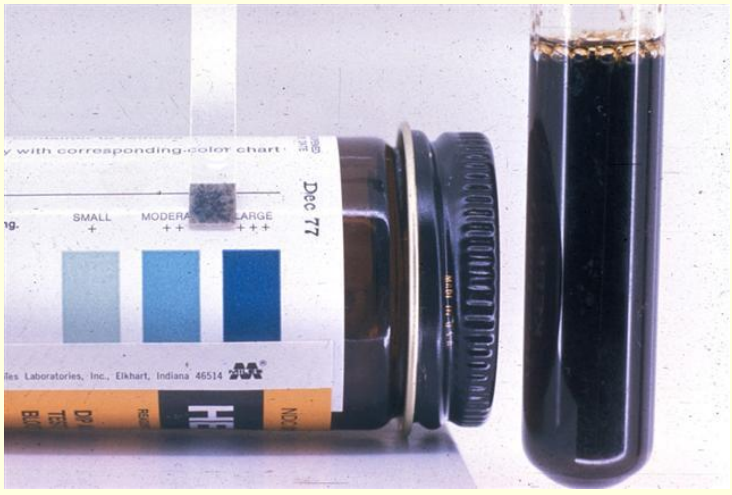
- Severe peri-portal fibrosis
- Severe widespread hepatic necrosis
- Megalocytosis of hepatocytes
- Marked biliary hyperplasia

Explanation - The most common microscopic finding is severe hepatocellular necrosis. Inflammatory cells may also be observed. The exact mechanism of disease is unknown but may possibly involve a type III hypersensitivity reaction. The original disease was described by Arnold Theiler in South Africa (1918) after vaccination of a herd of horses against African Horse Sickness. Thus, the disease became associated with administration of equine biological products. However, the administration of an equine biological is not always present in the history.

The other answer choices (peri-portal fibrosis, megalocytosis, and biliary hyperplasia) are pathologic hallmarks of pyrrolizidine alkaloid toxicity.

Question

You examine an 8-year old pleasure horse because the owner has noted weight loss, poor appetite and a loss of energy over the last few weeks, and today saw dark urine. The horse's temperature is 101F, HR is 56, and RR is 40. You catch a stream of urine from the mare and it is dark red (see photo). The sclera is slightly yellow. You submit blood to the lab for a CBC and chemistry panel and find that SDH, GGT, ALP, AST, total bilirubin, direct and indirect bilirubin are all markedly elevated, and the PCV is 23%. What do you tell the owner the mare has?



- Equine infectious anemia
- Tyzzer`s disease
- Hepatic failure with secondary hemolysis
- West Nile virus
- Immune mediated thrombocytopenia

Explanation - When the liver fails in the horse, it often results in a hemolytic crisis as RBCs become more fragile due to toxic metabolites in the blood. This crisis is usually fatal and indicates terminal stages of liver failure in the horse.

Question

You are examining a 7-year old Thoroughbred gelding for a 5-day history of anorexia and jaundice. Which of the following enzymes would you consider to be liver specific in the horse?

- Alanine Aminotransferase (ALT) and Aspartate Aminotransferase (AST)
- Sorbitol Dehydrogenase (SDH) and Gamma Glutamyl Transferase (GGT)
- Gamma Glutamyl Transferase (GGT) and Alanine Aminotransferase (ALT)
- Alkaline Phosphatase (ALP) and Sorbitol Dehydrogenase (SDH)

Explanation - You have to read the possible answers carefully in this question and recall which enzymes are liver-specific in the horse. In this instance, SDH and GGT are both liver-specific; SDH is found in the liver of all animals. An increase in serum SDH concentration suggests hepatocellular injury. Elevation in serum GGT is predominately associated with biliary epithelial cells and is also liver-specific.

The other enzymes listed may be increased with liver disease but may also arise from bone (ALP) or muscle (ALT, AST).

Question

What is the causative agent of Tyzzer's disease?

- Clostridium difficile
- Clostridium perfringens
- Clostridium botulinum
- Clostridium chauvoei
- Clostridium piliforme

Explanation - The correct answer is Clostridium piliforme. This is a motile, filamentous, gram negative, spore forming bacterium. Of note, all Clostridia are categorized as gram positive organisms with the exception of

Clostridium piliforme, which is gram negative (yes, Microbiology is confusing). Clinical signs associated with Tyzzer's include depression, anorexia, coma, convulsions, and jaundice. Horses between 6 days and 6 weeks of age are affected; however, most are affected at 1-2 weeks. Affected foals will have elevated liver enzymes, marked hypoglycemia, and acidosis.

Question

In horses, this disease will result in an acute necrotizing hepatitis.

- Chronic-active hepatitis
- Pyrrolizidine alkaloid toxicity
- Hyperadrenorticism
- Theiler's disease

Explanation - The correct answer is Theiler's disease (aka serum sickness or serum hepatitis). Tyzzer's disease will cause an acute multifocal to diffuse hepatitis along with necrosis too. PA toxicity results in the triad of biliary hyperplasia, fibrosis, and megalocytosis. Chronic-active hepatitis can cause a suppurative or lymphoplasmacytic inflammatory response in the liver.

Question

An 11-year old Peruvian Paso presents with a history of progressive weight loss. Serum chemistry shows elevation in sorbitol dehydrogenase, lactate, alkaline phosphatase, and a decrease in albumin. A vast amount of Crotalaria spp. is seen in the pasture. What type of toxin does Crotalaria spp. possess?

- Cyanide
- Organophosphate
- Nitrate
- Pyrrolizidine alkaloid

Explanation - The correct answer is pyrrolizidine alkaloid. The clinical signs described are typical for pyrrolizidine alkaloid toxicity. Consumption of this plant typically results in abnormalities in hepatic cell division; thus resulting in large hepatocytes known as megalocytosis.

Question

An 18-year old Miniature Horse mare is presented with signs of lethargy, anorexia and mild diarrhea of 5 days duration. Upon physical examination, the mare is quiet and lethargic with a heart rate of 56 beats/min, respiratory rate of 16 breaths/min and rectal temperature of 102.8F. The mare postures to urinate but only produces a small volume of urine. In addition, intestinal borborygmi are slightly increased and loose feces is noted staining the tail. You suspect the mare has colitis, thus prompting collection of blood for a CBC and

chemistry profile. After leaving the blood on the counter top for a few minutes prior to submission to the laboratory, you note the unusual appearance of the sample (see image). Based on the history and clinical examination, what would be the most likely abnormal clinicopathologic data measured from your blood samples?

- Elevations in serum triglycerides, gamma glutamyl transpeptidase (GGT), and sorbital dehydrogenase (SDH) suggestive of hyperlipemia and hepatic lipidosis
- Elevations in serum fatty acids and cortisol along with hypoglycemia suggestive of pituitary pars intermedia dysfunction (equine Cushinga's syndrome) with secondary colitis
- Hyponatremia, hypochloremia and hypokalemia suggestive of acute kidney injury
- Neutropenia, hyponatremia and metabolic alkalosis suggestive of colitis and pre-renal azotemia

Explanation - The most likely clinicopathologic changes that you would observe are elevations in serum triglycerides, GGT, and SDH. Unlike other larger sized horses, Miniature horses are susceptible to the development of hyperlipemia and hepatic lipidosis as a result of anorexia; the anorexia typically results from a primary disease, in this case mild colitis. Because of the negative energy balance, fats are mobilized in excess resulting in the opaque appearance of the serum.

The other answers have one incorrect variable within the response: colitis is associated with metabolic

academia, acute kidney injury is associated with hyperkalemia, and equine Cushing's syndrome is associated with hyperglycemia.