

Question

A 2-year old Brown Swiss with abomasal torsion is likely to have which electrolyte abnormalities?

- Hyperchloremia, hypokalemia and metabolic acidosis
- Hyperkalemia, hypocalcemia, and metabolic alkalosis
- Paradoxic aciduria, hypochloremia, and hyperkalemia
- Hyperglycemia, hypochloremia, and hyperkalemia
- Hypochloremia, metabolic alkalosis, and hypokalemia

Explanation - The correct answer is hypochloremia, metabolic alkalosis, and hypokalemia. As a result of torsion, affected animals sequester HCl in the abomasum and get hypochloremia. Additionally, animals become dehydrated and try to maintain adequate blood pressure by conserving sodium and in the process, retain bicarbonate, thus leading to an alkalosis. Because there is an alkalosis, hydrogen will exchange with potassium and exit of the cell to establish a normal pH; this leads to hypokalemia. Sometimes, as a result of decreased potassium and the need to retain sodium due to hypovolemia, the kidneys exchange hydrogen ions for sodium anions (instead of potassium for sodium), and thus hydrogen is excreted in the urine. This is known as **paradoxic aciduria** because there is actually a metabolic alkalosis, but since maintaining blood volume is more important, and there is now a shortage of extracellular potassium, hydrogen is lost in exchange for sodium.

Question

A herd of beef cows has been presented to you with an increase in lameness, diarrhea, poor body condition and infertility. You note achromotrichosis among several of the cows and decide to measure copper levels. What is the most sensitive way to measure copper levels?

- Splenic biopsy copper levels
- Brain sample for copper levels
- Plasma sample for copper levels
- Serum sample copper levels
- Liver biopsy for copper levels

Explanation - A liver biopsy is needed. Copper is stored in the liver, and the liver is very good at maintaining copper homeostasis until the very end. Therefore, the blood levels might look good, but in reality, the liver may have very little copper left to share with the rest of the body.

Question

A cow presents with a hard bony mass lesion at the ventral mandible (see image). Which treatment is known as being effective but is not recommended in pregnant animals as a result of concerns about it causing abortion and not for use in lactating dairy animals as a result of food safety issues?



- Penicillins
- Intravenous sodium iodide
- Ceftiofur
- Oxytetracycline
- Corticosteroids

Explanation - The correct answer is intravenous iodine. It is commercially available as a 20% solution at a dose of 15 ml/100 lbs. The clinical signs are suggestive of lumpy jaw, which is caused by *Actinomyces bovis*. The prognosis is poor, so most animals should be culled. Penicillins are reportedly successful at arresting the lesion in very early cases. However, there may be a better chance with intravenous 20% sodium iodide. That being said, due to concerns that iodide may cause abortion and because of food safety concerns, the label warns not to use sodium iodide in pregnant or lactating cattle.

Question

In an effort to control bovine virus diarrhea virus (BVD) in a herd of registered Holstein dairy cattle, the owner and veterinarian have worked to ensure that the herd is now BVD-free. Only a few heifer replacements are purchased, and all breeding is by artificial insemination from a commercial source. Which of the following is the most likely to achieve the goal of maintaining a BVD free herd in the future?

- Before purchase test all heifer replacements for the presence of BVD antibody using the serum virus neutralization test
- Before purchase, test all heifer replacements for BVD virus using immunohistochemistry on a skin biopsy
- Vaccinate all heifers at 6 months of age with killed BVD vaccine
- Be sure that a new clean rectal sleeve is used for each cow when doing rectal exams

- Vaccinate all cows over 2 years old with modified live BVD vaccine

Explanation – The correct answer is before purchase, test all heifer replacements for BVD virus using immunohistochemistry on a skin biopsy (Ear notch test). BVD is brought into herds such as this via persistently infected animals (BVD-PI) that were congenitally infected with BVD virus. These animals shed virus and infect herd mates. Thus it is necessary to check all purchased animals to be sure they are BVD free. It would also be wise to also vaccinate all cattle on this dairy with killed BVD vaccine just to ensure that if BVD did appear, it would be less likely to cause a major problem. Initial vaccination requires two injections, followed by a yearly booster. Vaccination alone however, will not keep the herd BVD free if a BVD carrier heifer is brought in.

Question

You are presented with a valuable cow for diagnosis and treatment. She was paste wormed yesterday using a paste gun and benzimidazole wormer. Today she has inappetence, mild bloat, extended head, drooling, and swelling and pain in the throat area. Her temperature is 104.5F on a cool morning. You diagnose _____.

- Pharyngeal trauma
- Actinobacillosis
- Choke
- Allergy to benzimidazole wormers

Explanation - On some occasions, a paste gun or other foreign body such as stick or wire in feed can penetrate the thin mucosa of the pharynx and result in severe acute infection and foreign body reaction. The mild bloat is due to the vagal nerve involvement of the inflamed throat region.

Question

A recently-freshened cow presents for decreased appetite and poor milk production. She is gaunt (thin) but otherwise looks normal. Which is the best differential?

- Cecal impaction
- Left displaced abomasum
- Salmonellosis
- Hypokalemia

Explanation - The correct answer is left displaced abomasum. LDAs occur most commonly after parturition and should always be considered. The other answer choices are not as common in ruminants, especially after parturition.

Question

You are called to a small beef and sheep ranch where the owner is concerned about a 1-year old steer which has cloudy eyes, mucoid nasal discharge, thickened and cracked skin, and diarrhea. You examine the animal and find T=107F, HR=105, RR=40, corneal opacity and thick white nasal discharge (see photo), thick cracked skin all over the animal, enlarged prescapular lymph nodes, and diarrhea with small amounts of blood in it. There are also some oral erosions.

Based on the PE you tentatively diagnose this condition.



- Bovine viral diarrhea (BVD)
- Bovine papular stomatitis
- Vesicular stomatitis
- Malignant catarrhal fever (MCF)

Explanation - MCF is caused by a herpes virus carried by **sheep** in North America and called ovine herpesvirus type 2. The virus affects lymphocytes and allows the animal's own killer cells to attack blood vessels, resulting in arteritis. **Arteritis** results in multisystemic signs, high fever, and **enlarged lymph nodes**. The acute severe form such as described here is usually fatal.

While a small number of cattle with BVD may develop corneal opacity, they do not usually have the enlarged lymph nodes and the combination of other signs seen with MCF.

Question

A 6-year old dairy cow presents with a **6-week history** of progressive abdominal distension and loss of body condition. The cow has had a poor appetite and appears anxious. On rectal exam, there is only scant feces that are hard fecal balls coated in mucus. The abdomen is markedly distended from "10 to 4 o'clock" when viewed from behind (see image). Temperature is 100.9 F, heart rate is 36 beats per minute, and respiratory rate is 24 breaths per minute. There is increased force of rumen contractions occurring four times per minute. You pinch the cow's withers and she lowers her withers normally. Passage of a stomach tube yields a small amount of gas. Ultrasound of the anterior abdomen is within normal limits (no abscesses seen). Abdominocentesis yields a small quantity of straw-colored fluid with low protein concentration and low numbers of cells, mainly lymphocytes and is considered within normal limits. What should you tell the farmer?

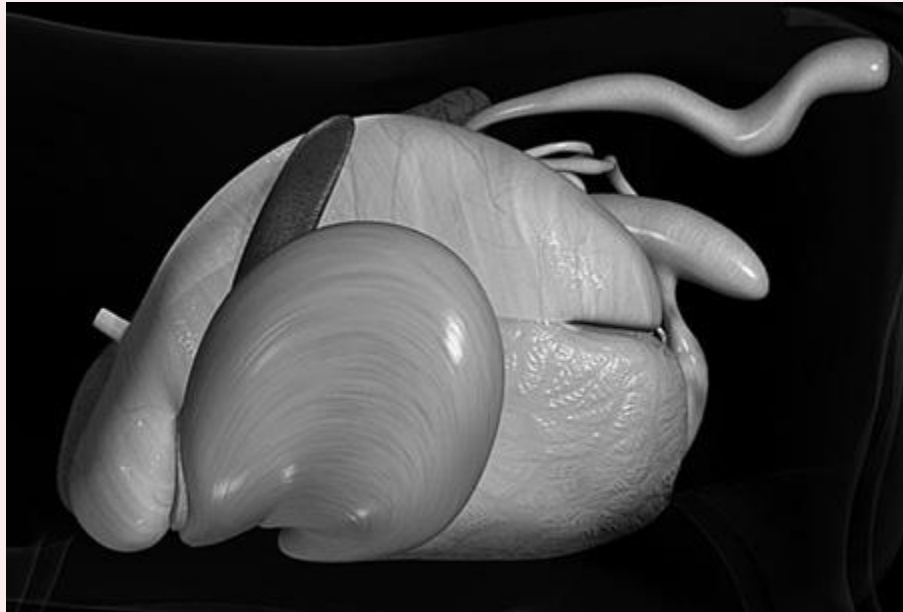


- The cow appears to have vagal indigestion of undetermined cause and is unlikely to respond to medical management
- The cow appears to have free gas bloat and requires trocarization of the rumen and possible rumenotomy
- The cow appears to have frothy bloat and requires antifoaming agents
- The cow appears to have an impaction from Ostertagia or Haemonchus and should be treated with levamisole

Explanation - This cow likely has vagal indigestion based on the chronicity and clinical appearance. Bloat is typically much more acute. Due to the severity and chronicity of this cow's signs, its prognosis should be considered poor even without determination of the specific underlying cause. Most cases of vagal indigestion require surgery to identify the underlying cause and medical management alone is usually ineffective.

Question

A 3-year old Holstein dairy cow is one month fresh and the milker has noted that her production has dropped in the last week. On physical exam you find normal TPR, a gaunt abdomen, scant but normal-appearing feces, and no abnormalities on rectal exam. She has a prominent ping with variable changing pitch on the left side of the abdomen between the 10th and 13th ribs when simultaneous auscultation and percussion are used. The image shows a model of her abdominal organs viewed from the left side. What is the correct diagnosis?



- Gas in the rumen
- Abomasal volvulus
- Left displaced abomasum
- Free abdominal gas from uterine rupture
- Right displaced abomasum

Explanation - The gas-filled abomasum has moved from its normal position near the ventral midline to the left of the rumen, where it is trapped (see image). As gas bubbles in and out, it sounds like the end of a toilet flush. When percussed and auscultated, the changing gas pressures yield a variable high-pitched ping.



Rumen Ping



LDA Ping

Question

You examine a 4-year old Holstein dairy cow that was a high producer for the first 2 months of the current lactation but has suddenly developed poor appetite and a markedly decreased milk production. On physical exam, you find temperature is 103.5F, HR=55, there is no rumen motility palpable or audible, and feces are scant. The cow has a papple shape when viewed from the rear (see image), with a slight "boink" hollow sound over the left flank. What is your tentative diagnosis?



- Grain overload
- Cecal displacement
- Left displaced abomasum
- Vagal indigestion

Explanation - The most common cause of vagal indigestion is a metallic foreign body penetrating the reticulum (hardware disease). The local peritonitis leads to poor motility of the forestomachs, so that the rumen fills with fluid and develops a gas cap, and the abomasum accumulates fluid; these give the shape from the rear of pear on the right and apple on the left (papple shape) as seen in the photo.

Question

A farmer brings a cow to you with the complaint that the cow is losing weight and not appearing to eat well. On physical exam you find that the tongue is hard and swollen, as shown in the image. How would you treat this cow?



- Penicillin
- Sodium iodide
- Euthanasia, and notify the state officials
- Ceftiofur

Explanation - The tongue is the most frequently infected area, although other soft tissues can be infected. The infection is introduced by breaks in the mucosa, allowing the normal rumen inhabitant, *A. lignieresii*, to invade and cause painful granulomas. The disease can often be successfully treated with IV sodium iodide; although certain other systemic antibiotics including tetracyclines can be used. The sodium iodide is given intravenously once and repeated again in 7-10 days. It is given at a concentration ranging from 5-20%.

Question

A 2.5-year old Guernsey, presents for clinical signs of colic. There is a history of very little feces being passed over the last 24 hours. On rectal exam, a distended structure can be palpated just cranial to the pelvis. The structure feels like a loaf of bread. Additionally, there is a right sided ping heard from the last rib to the pelvis, high up. The rest of the physical was unremarkable. What is your top differential?

- Cecal displacement or torsion
- Intussusception
- Right displaced abomasum
- Torsion of the omasum and abomasum
- Cecal tear

Explanation – The correct answer is cecal displacement or torsion. The 3 most common causes of colic are intussusception, cecal dilation with or without torsion, and abomasal volvulus. You can quickly rule out the torsion of the omasum and abomasum and the RDA, as the ping would be lower on the right and in front of the last rib, plus you would not have palpated the "loaf of bread" rectally. Cattle with intussusception usually have scant dark blackberry jam-colored feces and on rectal exam, sometimes have a palpable hard and painful mass on the right.



RDA/RTA Ping



Cecum Ping

Question

Several cows on a farm have developed large very hard masses along the jaw and you have diagnosed Actinomycosis. What management change would you recommend?

- Euthanize all affected cows
- Remove scabrous feeds
- Supplement iodine in the feed
- Initiate insect control measures

Explanation - The bacteria causing lumpy jaw (*Actinomyces bovis*) is a normal inhabitant of the cow's oral cavity or rumen and causes disease when it is able to invade into damaged mucosa, most frequently caused by scabrous or prickly feed.

Question

The photo shows a 3-year old dairy cow which has suddenly developed an enlarged abdomen, is acutely down on milk production, and is not eating. She freshened one month ago, and was a high producing cow. On physical exam, you find a large ping on the right side from just behind the last rib to the 10th rib, and note a large amount of fluid in both the right and left sides of the abdomen on ballottement. T=101 F, HR=120, and RR=42. You diagnose abomasal torsion/volvulus and prepare her for surgery. What fluid should she be treated with?



- IV saline with 20 meq/L added potassium
- IV sodium bicarbonate
- IV lactated Ringer`s solution
- IV 50% glucose, 1 liter
- Oral saline plus 40 meq/L added potassium

Explanation - A cow with abomasal torsion is accumulating chloride in the forestomachs, which results in hypochloremia and metabolic alkalosis. This in turn leads to hypokalemia as potassium rushes into cells when all available hydrogen ions leave the cells. The treatment of choice is thus **IV saline** (154 meq/L Na and 154 meq/L Cl) **plus potassium**. A good rule of thumb for rate of IV administration of **potassium is not to exceed 0.5 meq/Kg /hour**. So a 500 Kg cow can receive 250 meq/hr safely (which is 12 liters/hr of the fluid described). Oral fluids will simply add to the fluid-filled rumen.

Question

Several Jersey cows present with a history of decreased appetite and excessive salivation. On physical exam, their tongues are firm on palpation, nodular, and painful (see image). You diagnose actinobacillosis. What is your recommendation to the owner?



- Isolate animals at once
- Sell affected animals for meat
- Change feed and treat
- Begin therapy with an aminoglycoside
- Isolate affected animals and submit one of them for necropsy

Explanation - The correct answer is to change feed and begin treatment of the animals affected with woody tongue, as the **response is often good**. Sodium iodide and antibiotics are effective. Given the presentation and

clinical signs these animals have probably begun to ingest **very rough and stemmed (scabrous) feed** items which have injured their mouths. Upon injury, the normal inhabitant *Actinobacillus lignieresii* invades the soft tissues and causes the characteristic woody tongue granulomatous inflammation.

These animals don't have rabies, and there is no need to cull them. Change feed before additional animals are affected. Do not use aminoglycosides in dairy animals as they have an extremely long withdrawal period.

Question

You examine a valuable beef bull which has been in a remote pasture unobserved for several months. The owner has noted that he has a swollen lower jaw. You note the hard, relatively non-painful swelling shown in the photo and diagnose _____.



- Osteosarcoma
- Lymphoma
- Actinomycosis
- Tooth root abscess
- Actinobacillosis

Explanation - Also known as lumpy jaw, this condition results from the entry of the normal rumen inhabitant *Actinomyces bovis* into the bony mandible (usual site) or maxilla through a break in the mucous membranes or teeth. **It may be arrested with therapy using sodium iodide**, antimicrobials or even isoniazid off-label, but the bony swelling seldom changes much, even if arrested.

Question

What is the age of a beef cow which has only the first and second permanent incisors present?

- Approximately 1 month
- Approximately 1.5 years
- Approximately 6 months
- Approximately 2.5 years

Explanation - The correct answer is approximately 2.5 years of age. A good rule of thumb is that the permanent incisors are in wear at 1.5, 2.5, 3.5 and 4.5 years of age (permanent incisors 1, 2, 3, and 4 respectively).

Question

Bleeding abomasal ulcers (sometimes called type 2 ulcers) have been diagnosed in a 2-year old dairy cow with melena and anemia. Which of the following treatments is contraindicated?

- Ranitidine
- Flunixin meglumine
- Blood transfusion
- Omeprazole

Explanation - Flunixin meglumine is contraindicated in this case. This drug (aka Banamine) is a non-steroidal anti-inflammatory drug (NSAID) and will only promote more ulceration because NSAIDs decrease mucosal blood flow. Blood transfusions are sometimes given if the bleeding is severe. Omeprazole (a hydrogen pump blocker) and ranitidine can be beneficial in calves and raise the abomasal pH, but not useful orally in adults. In adults, IV ranitidine can be used but is very expensive and reserved for high-value animals.

Question

Which of the following situations is most consistent with a diagnosis of Foot-and-Mouth disease?

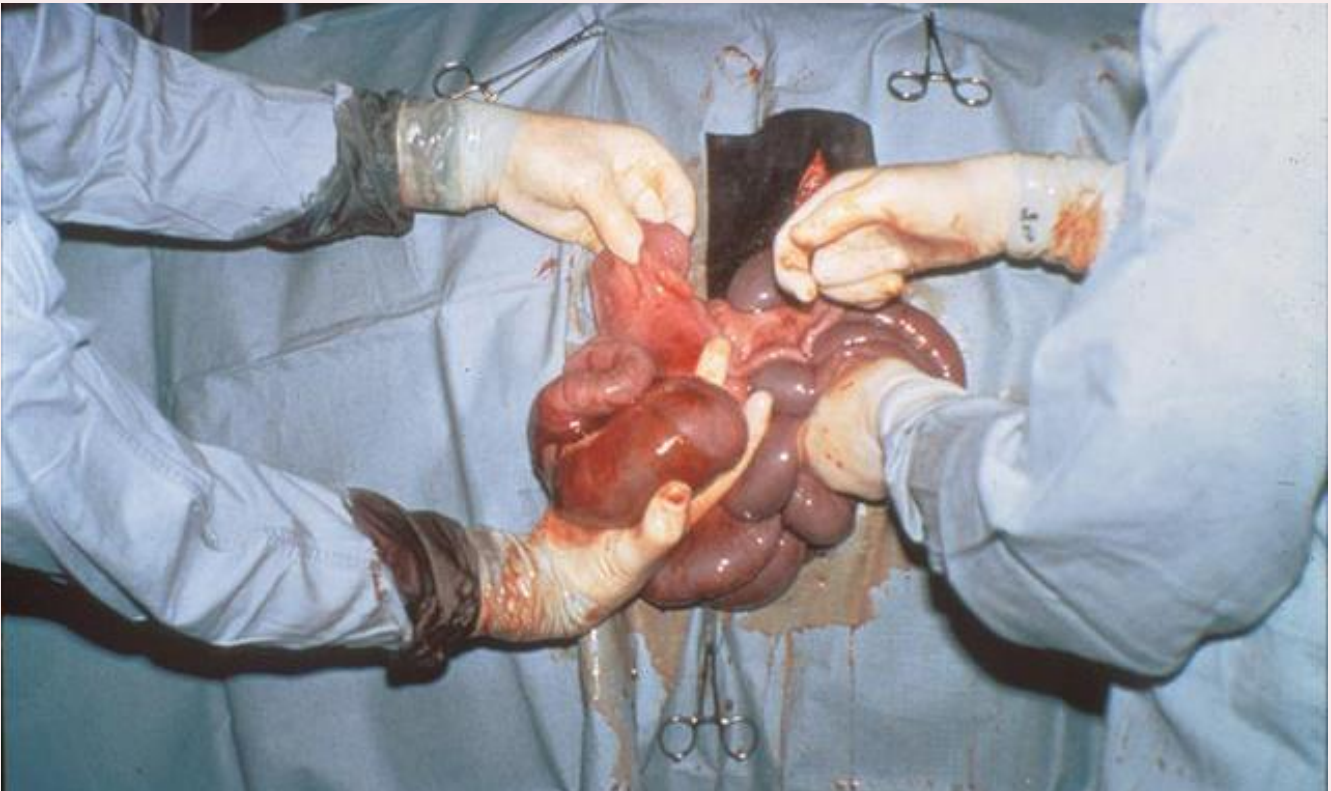
- Sheep are not affected by the disease
- Cattle are affected with oral and foot lesions and horses are unaffected
- Horses are affected by foot lesions while cattle are affected with oral and foot lesions
- Horses and pigs will not be affected by the disease
- Both cattle and horses are equally affected with oral and foot lesions

Explanation - The correct answer is cattle are affected with oral and foot lesions and horses are unaffected. Only cloven-hoofed animals are affected by FMD. Therefore, sheep and pigs are susceptible and horses remain unaffected. If lesions are observed in swine, it is important to differentiate FMD from swine vesicular disease. In cattle, it is important to differentiate FMD from vesicular stomatitis, bovine papular stomatitis, pseudocowpox, and bluetongue. Another point is that sheep will not be affected by vesicular stomatitis.

Question

You have decided that you need to do an exploratory right flank surgery on a valuable cow because she has colic and abdominal distention, and is passing scant amounts of dark red feces. There are no obvious pings. She is dehydrated (skin turgor is abnormal and eyes sunken) and totally anorectic. The owner reports that she was normal two days ago when he last looked at her closely.

On exploratory surgery under local anesthesia you find a hard 6- to 8- inch long by 4-inch diameter mass in the small intestine, as shown in the photo. It is painful to the cow when it is touched. The bowel proximal to the mass is distended and the bowel distal is empty. How would you treat this?



- Close the cow and give antimicrobial drugs, laxatives and IV fluids
- Manually reduce the mass and close the cow
- Surgically resect the intussusception
- Perform a surgical bypass of the mass but do not remove it
- Euthanize the cow as this is an inoperable tumor

Explanation - Hopefully you will be able to recognize that the "mass" visualized in this image is an intussusception. After removal, an end-to-end anastomosis of the intestine is performed, and the cow is aggressively treated with antimicrobial drugs and IV fluids with a good content of chloride, such as saline, since these animals are usually suffering from **hypochloremic hypokalemic metabolic alkalosis**.

Question

A show bull is brought to your clinic on a Sunday because the owner noted that the bull is reluctant to eat hay or grain and has a swollen throat area (photo). The owner gave him a magnet (to prevent TRP) orally via balling gun two days ago in preparation for the show season. You examine the bull in the chute and find T=105F, HR=95, and RR=50 and that he is coughing occasionally. He has decreased rumen motility and mild bloat. The bull is reluctant to allow you to palpate the external throat area. His breath smells necrotic, but you are not able to see any obvious lesions in his mouth with the light you have. No other abnormalities are noted. You suggest to the owner that additional diagnostic tests may help, but you think the signs indicate that he likely has _____.



- Traumatic reticuloperitonitis (TRP)
- Anaplasmosis
- Pharyngeal trauma
- Abscessed tooth
- Woody tongue (Actinobacillosis)

Explanation - The owner may have traumatized the pharynx when he used a balling gun to introduce a magnet to the bull. In fact, radiographs subsequently showed that he has a magnet in the retropharyngeal tissues. The magnet was retrieved and the bull healed on antibiotics, NSAIDs, and a soft diet. Pharyngeal trauma is often iatrogenic (paste worming guns, balling guns etc), but can also occur from a stick or metallic foreign body in feed penetrating. The prognosis is usually good with this conservative therapy.

Question

This dairy cow in the picture presents for a decrease in appetite and milk production. You systematically do your physical exam and as you percuss and auscultate you hear a monotone "boink" on the left side, dorsally, approximately between rib spaces 9-13 and extending to the hip. What gas-filled organ are you hearing?



- Cecum
- Spiral colon
- Rumen
- Abomasum

Explanation - The correct answer is rumen. The **location extending up to the hip** and the **monotone "boink"** (not ping) are indicative of the rumen. A cow with LDA would have a **variable-pitched ping** heard to only just **in back of the last rib** (not to the hip). It is variable because the rumen is usually still contracting medial to the displaced abomasum, and the changing gas pressures result in a pitch that changes during percussion and auscultation.

Question

A 3-year old Jersey dairy cow presents 8 days after parturition with decreased milk production, anorexia, teeth grinding, episcleral injection, and colicky behavior. On physical exam, you observe distention of the right flank, a wide region of right sided monotone pinging from the 9th rib to behind the 13th rib, and no rumen contractions. On rectal exam, you note normal-appearing feces and a large turgid structure palpable to the right of midline and as far forward as you can reach. The cow is negative for xiphoid pain. Temperature is 103.3F degrees, HR=98, and respiration is 44. What is the most likely diagnosis?

- Cecal displacement or volvulus
- Gas in the spiral colon
- Abomasal torsion
- Intussusception

Explanation - The correct answer is abomasal torsion. The clinical signs described are classic for an abomasal torsion. These are much less common than left or right displaced abomasum. However, the risk factors for developing abomasal torsion appear to be the same. This finding is a **surgical emergency** and must be corrected before cows go into shock. Another factor is that many times you may be able to palpate abomasal torsion rectally, but not always.

Cecal displacement and cecal volvulus can be ruled out because you would likely be able to palpate these disease processes via rectal examination in addition to hearing a ping high in the right flank. Animals with intussusception are very colicky and have scant dark red feces. The intussusception is rarely palpable rectally, but can be found sometimes as a **firm painful mass**. Gas in the spiral colon is a frequent finding in any sick cow with poor GI motility and is not a primary disease problem. It is diagnosed by finding an 8-inch circular ping high on the last rib or just behind it.

Question

You examine a 3-year old Holstein dairy cow on a small farm that pastures the animals every day in the summer. This cow, purchased as a 2-year old springer, was producing 80 lbs of milk per day in the 4th month of her lactation, but she suddenly lost a tremendous amount of weight in the last month (see photo) and developed watery green diarrhea. She has a normal TPR but is weak and rail thin. What should you tell the owner that you suspect the cow has?

- Fatty liver
- Grain overload (lactic acidosis)
- Ostertagiasis
- Salmonellosis
- Paratuberculosis (Johne`s disease)



Explanation - Caused by *Mycobacterium avium* ssp *paratuberculosis*, this infectious disease causes a **granulomatous ileitis and colitis**. Diarrhea usually results. The affected bowel dumps albumin into the lumen, and the cow can lose weight extremely rapidly, although this is highly variable. Confirmatory tests such as a serum ELISA should be done

Question

Which of the following is most appropriate for increasing the rumen pH of a cow with rumen acidosis to the optimum range?

- Magnesium oxide
- Propylene glycol
- Vinegar
- Bismuth subsalicylate

Explanation - The correct answer is **magnesium oxide**, which becomes Mg OH in the rumen. You may also use magnesium hydroxide or magnesium carbonate. Vinegar will cause acidification of the rumen and is therefore a poor choice. Propylene glycol and bismuth subsalicylate will not affect rumen pH significantly.

Question

While performing a rectal exam on a cow showing teeth grinding, restlessness, kicking at the abdomen, and scant dark blackberry jam feces you are able to palpate a sausage-shaped mass. What is your diagnosis?

- Intussusception
- Fat necrosis
- Lymphoma
- Abomasal ulcers

Explanation - The correct answer is intussusception, a cause of colic in cattle. Feces become scant and then become dark red as the bowel mucosa undergoes death. Palpating a painful sausage-shaped mass is classic for an intussusception, which usually occurs in the ileum in adult cows. Although lymphoma or fat necrosis can create the sausage shaped mass, they are less likely and would not have the sudden onset or show the dark feces. Peritonitis may result secondary to the intussusception. Abomasal ulcers result in melena and anemia which can progress to death if not addressed.

Question

At what age will you see a permanent third incisor in wear (not age of eruption) in a cow?

- Approximately 3.5 years
- Approximately 2.5 years
- Approximately 1.5 years
- Approximately 4.5 years

Explanation - The correct answer is approximately 3.5 years of age. A good rule of thumb is that the permanent incisors are fully erupted and in wear at 1.5, 2.5, 3.5 and 4.5 years of age (permanent incisors I1, I2, I3 and I4 respectively). The first permanent incisor erupts at 18 to 24 months, the second at 24 to 30 months, the third at 33 to 36 months, and the fourth erupts at 42 and 48 months. This means that the rough rule of thumb is a bit off for I1 in some animals, but it does help to remember these approximate times. There is some individual and some breed variability. After eruption, each tooth takes about 6 months before it is in wear.

Question

You are called over to a beef ranch to evaluate a herd with a history of diarrhea, reproductive problems, and occasional cerebellar hypoplasia. You suspect an underlying infection with bovine viral diarrhea. How is this virus most likely being maintained in the herd?

- Cattle that were persistently infected with both the noncytopathic and cytopathic biotypes of BVD virus shortly after birth
- Persistently-infected carrier cattle that were infected as fetuses
- Wildebeest carriers of the virus which are asymptomatic
- The insect reservoir *Culicoides sonorensis*
- Sheep carriers of the virus which are asymptomatic

Explanation – The correct answer is Persistently-infected carrier cattle that were infected as fetuses. A susceptible non-immune cow carrying a fetus between **60 and 150 days gestation**, if infected by a **non-cytopathic** biotype of BVD, can pass the virus to her fetus which may become persistently infected. This calf can spread virus to herd mates for the duration of its life.

Question

What are the effects on chloride and acid-base balance when pyloric outflow is impeded in a ruminant?

- Decreased serum chloride and metabolic alkalosis
- Increased serum chloride and metabolic alkalosis
- Increased serum chloride and metabolic acidosis
- Decreased serum chloride and metabolic acidosis

Explanation - The correct answer is decreased serum chloride and metabolic alkalosis. This occurs as a result of the intestines not being able to reabsorb chloride back into the blood stream after it is secreted into the abomasum. Chloride is a strong anion and results in metabolic alkalosis when it is decreased.

Abomasal torsion, Vagal indigestion (pyloric block), and Intussusception are examples of these electrolyte abnormalities.

Question

Mucosal disease, or alternatively, chronic Bovine Virus Diarrhea (BVD) occurs in cattle when:

- A 5-month old calf is persistently infected with a strain of BVD virus which coats platelets; platelets are then removed by the RE system resulting in a bleeding diathesis.
- A 5-month old calf which was persistently infected as a fetus with a non cytopathic (nonCPE) biotype of BVD virus is superinfected with a cytopathic (CPE) biotype of BVD due to rearranging of the parent non-CPE viral RNA.
- A 5-month old calf is infected with CPE biotype of BVD virus and then superinfected with a nonCPE biotype of BVD virus.
- BVD type 2 infects a 5-month old calf.
- A 5-month old calf which was persistently infected with the nonCPE biotype of BVD virus as a fetus forms antigen-antibody complexes which cause a fatal immune-mediated disorder.

Explanation - The correct answer is A 5-month old calf which was persistently infected as a fetus with a non cytopathic (nonCPE) biotype of BVD virus is superinfected with a cytopathic (CPE) biotype of BVD due to rearranging of the parent non-CPE viral RNA.

Question

You examine a 3-year old dairy cow (see image) with severe acute diarrhea on a hot summer day. She freshened 3 days ago, and her appetite and milk production are now markedly decreased. The watery green/brown feces are foul and fetid smelling. The cow has a rectal temperature of 106F, HR=90, and rapid respiratory rate but no cough. There is scleral injection and one weak rumen contraction per minute. You take lab samples to make what preliminary diagnosis?



- Salmonellosis

- Malignant catarrhal fever (MCF)
- Bovine viral diarrhea (BVD)
- Potomac fever
- Paratuberculosis (Johne's disease)

Explanation – The correct answer is **Salmonellosis**. This cow is in the most susceptible fresh cow group, and has all the clinical signs of an **invasive bacterial diarrhea**; the foul smell of the feces indicates serum proteins in the feces that make it smell like it was produced by a meat eater. The effects of absorbed endotoxins (LPS) create fever, decreased appetite, decreased rumen activity, and scleral injection (enlarged and dark scleral vessels).

Question

A dairyman is trying out a new feeding protocol to help increase milk production. Since he instituted the change a week ago, several of his best cows have become mildly depressed, dropped in milk production, and several have developed diarrhea. A needle aspirate from the rumen two hours after feeding reveals an average pH of 5.2 among these cows. What is the most likely diagnosis?

- Hardware disease (TRP)
- Vagal indigestion
- Grain overload
- Left displaced abomasum

Explanation - The correct answer is **grain overload**, also known as **rumen acidosis** or **lactic acidosis**. The change in feeding protocol coupled with the fact that **rumen pH is below 5.5** in the most productive cows make this the correct answer.

Question

A 2-year old Holstein heifer presents for depression and decreased milk production over the previous week. On physical exam, it is noted her posterior shape is "papple" and she is slightly dehydrated. T=100.2, P=62, R=28. She does not have episcleral injection. Rumen contractions are not present. Xiphoid pain response is negative and you are able to hear a monotone ping in the rumen on the left side from the 11th rib to the hip. On ballottement and rectal exam a large fluid-filled rumen is palpable. Which of the following is the most likely diagnosis?

- Grain overload (rumen acidosis)
- Failure of omasal transport
- Left displaced abomasum (LDA)
- Abomasal torsion or volvulus

Explanation - The correct answer is **failure of omasal transport**, a **form of vagal indigestion**, which leads to an accumulation of fluid and some dorsal gas in the rumen, lack of motility, and inappetance. TRP is a common cause of vagal indigestion; the negative grunt test for xiphoid pain is the result of chronicity and formed adhesions that are no longer acutely painful. It is difficult to clinically distinguish between omasal transport failure and pyloric outflow failure, except that the latter usually has more profound acid-base and electrolyte disturbances, and the cow will appear sicker as a result.

Abomasal torsion can be immediately ruled out because there is no abomasal ping on the right. In addition, if it were a right displaced abomasum, the cow would be showing more signs of distress and systemic disease such as episcleral injection and an elevated heart rate. Left displaced abomasum can be ruled out because the ping is monotone (LDA ping is variable in pitch) and the ping extends all the way back to the hip. Further, the large fluid filled rumen is rectally palpable, whereas a cow with LDA would have an empty rumen. Grain overload (rumen acidosis) would have a large fluid filled rumen, but the cow would be very sick with scleral injection and rapid heart rate.

Question

A 4-year old Holstein dairy cow in mid-lactation has developed acute onset illness and is colicky (kicking at abdomen, switching her tail, repeatedly lying down and getting up). Her temperature is 102.0F, HR is 100/min, her scant feces are sticky and dark blackberry jam-colored, her abdomen is distended, and there is no rumen motility. No pings are audible. Her PCV= 30% (24-46%). A blood gas and electrolyte panel reveals Na=140 mEq/L (136-144 mEq/L), K=2.5 meq/L (3.6-4.9 mEq/L), Cl=80meq/L (99-107 mEq/L), and HCO₃=40meq/L (20-30 mEq/L). Based on these clinical signs and lab values, which of the following is most likely to be the correct diagnosis?

- Intussusception
- Abomasal ulcer
- LDA
- Cecal dilation
- Salmonellosis

Explanation - The only choices likely to cause colic are intussusception, cecal dilation, and abomasal ulcer. Of those 3, only intussusception would cause scant, sticky, dark feces. The intussusception usually occurs in the jejunum or ileum, and results in a backed-up GI tract. This causes chloride to be sequestered in the abomasum, as well as internally vomited into the rumen, resulting in hypochloremia, hypokalemia, and metabolic alkalosis. A PCV of 30% is normal for a cow, so a bleeding ulcer is unlikely; the HR of 100/min in this case is likely due to pain rather than anemia.

Question

A 6-year old Friesian cow presents to you with a mass on the left mandible (see image). The farmer reports that the mass has developed over the last several weeks and the cow has recently had some difficulty eating and lost weight. On examination, the mass is firm, immobile, and painful on manipulation. You note a thick discharge with small granular particles. Based on the most likely diagnosis, what should you tell the farmer?



- Intravenous penicillins are likely to be effective
- Treatment with sodium iodide intravenously is likely curative but the cow's milk and meat will not be suitable for human consumption for 120 days
- The most effective treatment is oral sodium iodide
- Treatment is unlikely to be successful and the cow should be culled

Explanation - This is a case of *Actinomyces bovis* or "lumpy jaw". The keys to the diagnosis are the firm mass that is immobile over the mandible. The presence of "sulfur granules" in the discharge is also a characteristic finding with this disease. Unfortunately, simply making the diagnosis is not sufficient to answer this question correctly. All of the answer choices are potential treatments for lumpy jaw but this represents a moderate to severe case which is **unlikely to respond to treatment** due to difficulty in achieving the necessary antibiotic concentration over a sustained period. Therefore, the best answer choice in this case is to **cull** the cow.

Question

Several 2- to 4-year old cows in a herd have been losing weight and suffering with chronic watery diarrhea for the past eight months. Which of the following is a good differential?

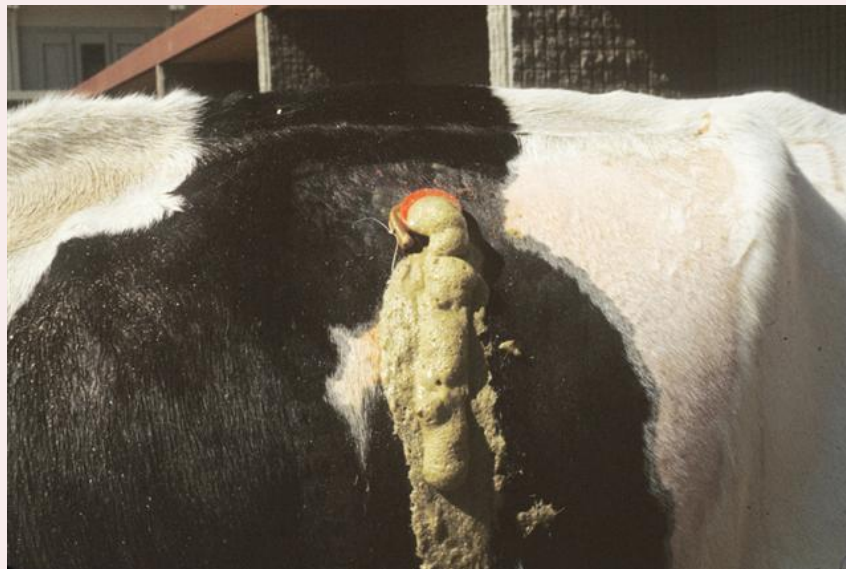
- *Mycobacterium avium* subsp *paratuberculosis*

- Arcanobacterium pyogenes
- Rotavirus
- Enteropathogenic E. coli
- Pasteurella multocida

Explanation - The correct answer is Mycobacterium avium paratuberculosis (Johne's disease). This disease is known to affect cattle, goats, and sheep, as well as many species of exotic hoofstock. Infection usually occurs when they are young, but clinical signs do not show up until the animals are **stressed**. Clinical signs are essentially diarrhea and weight loss due to **hypoalbuminemia**. The other choices are poor in that they don't result in a herd problem of weight loss and diarrhea in adult cattle.

Question

You are called to examine and treat a cow which has eaten green chop alfalfa and has bloat. You first pass a stomach tube but little or no gas escapes, and the cow is in respiratory distress due to the tremendous abdominal pressure. You next insert a trocar into the rumen from the left flank and froth exits as shown in the photo. The pH of the froth is 6.2. You should now treat this cow with what drug to further relieve the bloat?



- Xylazine IV (1 mg/kg)
- Oral sodium bicarbonate (1 gm/kg)
- Tetracycline IM or IV (label dose rate)
- Proloxalene orally (44 mg/kg)

Explanation - **Proloxalene (Therabloat®)** is the answer. You need to treat with a substance to **reduce the surface tension and destabilize the froth**. The pH is within normal limits for rumen contents; therefore, oral bicarbonate is not beneficial. In a pinch, one could also use **cooking oil** to attempt to break down the foam.

Question

A three-year old Jersey cow presents for decreased milk production and weight loss. On physical exam, a hard, non-painful swelling of the mandible is identified. Radiographs of this region show lysis and productive bone lesions, with distortion of the teeth in the area. What is the most likely cause for these findings?

- Actinomycosis
- Osteosarcoma
- Actinobacillus lignieresii
- Vesicular stomatitis

Explanation - This cow has become infected with *Actinomyces bovis* (lumpy jaw) as a result of sustaining an injury in the mucous membranes, often from eating hard scabrous feeds. *Actinomyces bovis* is part of the normal oral and rumen flora and can become a source of infection when cows consume items that traumatize their mouths. The lesion classically causes a hard non-painful swelling of the mandible or maxilla along with productive and destructive bony changes. Teeth may be lost. Osteosarcoma is very uncommon in cattle and is therefore a poor answer choice. Vesicular stomatitis will not cause a hard non-painful swelling. Instead, you may see oral ulceration as a result of ruptured vesicles along the tongue. This virus can also cause lesions of the feet and teats. Cows infected with vesicular stomatitis will most likely be salivating, not eating, depressed, and febrile. *Actinobacillus lignieresii* is the causative agent of woody tongue. In this case, you would expect to see a large firm tongue on physical exam. Sodium iodide has been used to treat lumpy jaw, but this will only arrest the lesion.

Question

You are called to investigate a beef cattle operation where several young adults (1-2 years of age) have developed acute, watery diarrhea (see image). One of the affected cows died and a necropsy reveals worms and petechiae in the abomasum. The wall of the abomasum has a nodular "cobblestone" appearance that is most severe in the fundic region. Which of the following agents is most likely?



- *Haemonchus placei*

- *Ostertagia ostertagi*
- *Dictyocaulus viviparus*
- *Trichostrongylus axei*

Explanation - This is a description of **type II ostertagiasis**. The other parasites listed could be differentials with the exception of *Dictyocaulus* which is a lungworm. The main reason that *Ostertagia* is the best answer is the description of the abomasum. The **cobblestone appearance** which is also sometimes described as having a **Moroccan leather appearance** is essentially pathognomonic for *Ostertagia*. This occurs because *Ostertagia* larva undergo **hypobiosis** (larval inhibition) and lay dormant in the **early fourth larval stage** within the glands of the abomasum, forming the nodules. They resume development and emerge seasonally leading to severe signs.



Question

You are called to a dairy farm in the western United States because several cows are standing in the corral rather than eating with the others. They have been drooling and champing their mouths. The daughter's horse is also affected. On physical exam of the cows you find their rectal temperatures to be elevated and that their tongues are ulcerated as shown in the photo, but there are no other lesions you can find on the feet or teats. You call the state and federal veterinarians and say that this looks most like a case of _____.



- Bovine papular stomatitis (BPS)
- Woody tongue (actinobacillosis)
- Contagious ecthyma (Orf)
- Foot and mouth disease (FMD)
- Vesicular stomatitis (VS)

Explanation - VS occurs as an epidemic about once every 7 to 10 years in the western US. It appears to be spread by insect vectors and then spreads by contact and fomites from cow to cow once clinical disease occurs. Horses can also be affected by this virus.

Question

You are performing a routine fecal egg count on young cattle from a healthy herd and find a large number of the rectangular structures found in the image below shown at magnification from a 20X objective lens. What is your diagnosis?



- Tapeworm
- Liver fluke
- Hookworm
- Roundworm
- Lungworm
- This is not a parasite

Explanation - **Moniezia eggs** are rectangular (as shown) or triangular. Moniezia is an anoplocephalid **tapeworm** found in young cattle. Their life-cycle involves **oribatid mites** which live in the soil and are ingested by the host. Moniezia are generally considered **non-pathogenic** but may cause **intestinal stasis**.

Question

A recently freshened cow presents for decreased appetite and milk production. On physical exam, a left sided variable pitch ping is heard using simultaneous auscultation and percussion from the last rib and then diagonally downward to the 8th rib. Which is the most likely differential?

- Left displaced abomasum
- Hardware disease
- Free gas in the rumen
- Right displaced abomasum

Explanation - LDAs occur most commonly after parturition and should be considered. The ping described is classic for a left displaced abomasum. You can rule out a right displaced abomasum because the ping is described on the left side. Right displaced abomasum is much less common than LDA. There is no mention of stiff gait or xiphoid pain that would indicate a diagnosis of hardware disease. Free gas in the rumen is likely to be heard from the hip to the 8th rib and be a monotone ping.

Question

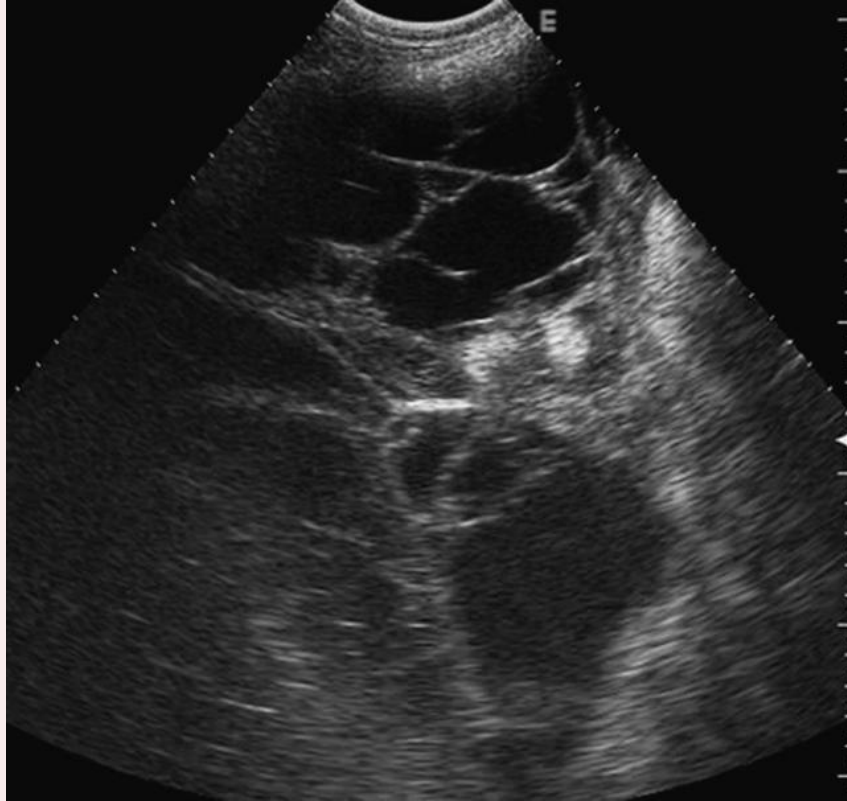
Mycobacterium avium ssp paratuberculosis is most commonly recognized in cattle at which age?

- 6 weeks to 6 months of age
- 6 months to 2 years of age
- 2-5 years of age
- Greater than 5 years of age

Explanation - The correct answer is 2-5 years of age, although younger and older animals can develop Johne`s disease. Mycobacterium avium ssp paratuberculosis is the causative agent of Johne's disease in cattle. It causes wasting, diarrhea, and decreased production. The disease is economically devastating. There is no recommended treatment for the disease. Animals testing positive should be culled.

Question

The ultrasound image of the abdomen of a three-year old dairy cow with fever, inappetence, scant but normal-appearing feces, and decreased rumen motility shows the presence of abdominal fluid and fibrin. Analysis also shows the fluid to have 5 gm/dL protein, and a WBC count of 200,000/uL, most of which are neutrophils. Which of the following is the most likely diagnosis?



- Ruptured bladder due to urolithiasis
- Hepatic fibrosis and ascites
- Hypoproteinemia of urinary tract origin
- Traumatic reticuloperitonitis (TRP)
- Mesothelioma

Explanation – The correct answer is **TRP**. The fluid is obviously inflammatory in origin, as judged by the presence of a large amount of fibrin. Other possibilities would be trauma to another part of the GI tract or the reproductive tract.

Question

Which of the following cows is most likely to develop fatty-liver syndrome if daily energy requirements were to increase?

- A cow with a body condition score of 2.5/5
- A cow with a body condition score of 4.25/5
- A cow with a body condition score of 1.5/5
- A cow with a body condition score of 3.0/5

Explanation - A cow with a body condition score of 4.25/5. Fat cows are more predisposed to fatty-liver syndrome when they encounter a negative energy balance. Shortly after postpartum, their energy needs

increase dramatically with lactation and they mobilize fat stores in such a manner that the liver cannot keep up with the triglycerides coming in. The result is hepatic lipidosis.

Question

At what period in production does displaced abomasum most commonly occur in dairy cows?

- First two weeks after being shipped
- First four weeks postpartum
- First two weeks after conception
- Mid- to late lactation

Explanation - First four weeks postpartum. This occurs for multiple reasons. Due to the increased metabolic demands from lactation, the diet changes drastically, and more gas is produced in the abomasum. Dairy cows often undergo a period of clinical or subclinical hypocalcemia. Hypocalcemia predisposes to decreased abomasal motility and may be a factor contributing to displacement (especially since there is more gas to move).

Question

This 3-year old Charolais cow in the picture presents with a 2-day history of not eating and looking uncomfortable and hunched up. There are no others in the herd affected. On physical exam, there is decreased rumen motility, a temperature of 105.2F, and a heart rate of 82 bpm. You perform a scooch test on the cow by firmly squeezing down over the withers. The test was positive (she refused to dip her back normally). What is your most likely diagnosis?

- Traumatic reticuloperitonitis
- Bovine spongiform encephalopathy
- Left displaced abomasum
- Grain overload

Explanation - This question provided a classic description of the presentation for **TRP**. The clinical signs can be vague and misleading, but the localization of xiphoid pain as shown with the scooch test is a strong indicator of TRP. With a positive scooch test, the cow will be stiff, reluctant to scooch down, and grunts may be heard. Sometimes the stethoscope needs to be placed over the trachea because the grunt may be soft. Additionally, the xiphoid region should be pushed up upon to see whether the cow reacts painfully. There is no mention of pinging that would indicate a displaced abomasum. Xiphoid pain would not be seen as a result of grain overload. Cows with bovine spongiform encephalopathy (mad cow disease) will show neurologic clinical signs such as hypermetric ataxia, hyperexcitability, and hyperesthesia.

Pinch & Grunt Tests



Withers Pinch (Scotch) Test

Many gastrointestinal diseases cause abdominal pain in the cow. Cows with GI pain often stand hunched up with their elbows abducted. The withers can be pinched as shown in the above picture (sometimes it requires two hands). A normal cow will flex her back ventrally when her withers are pinched as seen above. A cow who is painful will not flex ventrally. False negatives are common. Common reasons for abdominal pain are hardware, abomasal ulcers, or distention of the small intestine with gas.



Grunt Test

Either by using your fists pushed up with your knee or by using a board with one person on each side lifting the board up, apply pressure to the xiphoid region. If the cow grunts, kicks, or acts uncomfortable, you can assume she is painful. Often, you have to listen over the trachea during the peak of inspiration while simultaneously applying pressure to the xiphoid area to hear a grunt.

Question

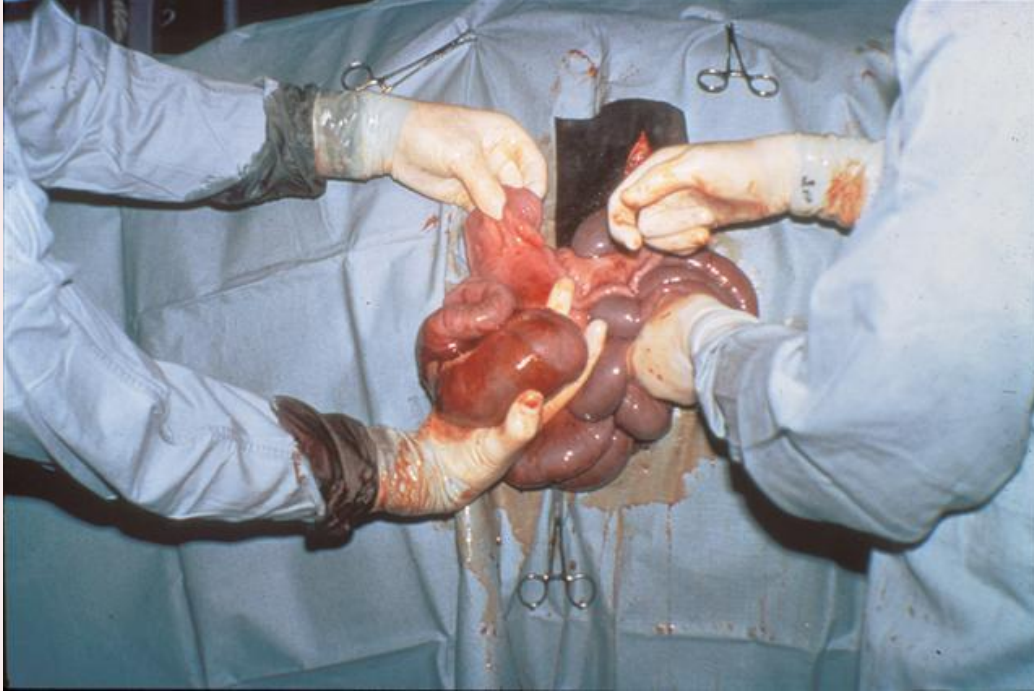
A herdsman is concerned about Johne's disease affecting his herd. He comes to you and asks what the treatments of choice for the affected cattle are. What is your response?

- Treat with rifampin
- Treat with tetracycline
- Cull all cattle that test positive
- Treat with penicillin
- Treat with chloramphenicol

Explanation - The correct answer is to **cull all cattle that test positive**. Johne's disease in cattle is caused by *Mycobacterium avium* subsp *paratuberculosis* affecting the small and large intestine. Clinical signs include emaciation, wasting, and edema, with variable diarrhea. Diagnosis is by serology and identification of the acid fast bacteria. There is no effective treatment for the disease. Positive animals must be culled from the herd.

Question

You have diagnosed a small intestinal intussusception in a valuable 3-year old Holstein cow and performed a right flank surgery (see image). What is the next correct step in treatment?



- Give her 11 liters of oral fluids containing 100 grams of potassium chloride
- Give her bethanecol to stimulate gut motility and achieve a medical cure
- Surgically remove the intussusception and anastomose the ends of the intestine
- Give her 50 liters of oral fluids containing isotonic sodium chloride
- Treat the cow aggressively with IV fluids containing sodium bicarbonate

Explanation - Surgically remove the intussusception and anastomose the ends of the intestine. Cows with intussusception usually have colic, scant dark red feces, dilated small bowel proximal to the lesion, and a distended abdomen from accumulated fluid in the proximal gut and forestomachs. They may also have a fever if there is leakage and peritonitis is developing. The lesion is sometimes palpable per rectum. They are most commonly suffering from hypochloremic hypokalemic metabolic alkalosis.

Question

Which of the following is a common means by which Bovine Virus Diarrhea (BVD) virus is maintained in a "closed" beef herd?

- By birth of calves persistently infected with BVD due to early-gestation in utero infection with specific types of BVD virus

- Transmission by a fly vector
- By commingling of cattle and dogs
- By ingestion of virus-containing animal neural tissue in concentrate mixes
- By ingestion of the L-3 to L-4 stages of intermediate host, roundworms
- By direct infection/re-infection of vaccinated cattle from outside sources

Explanation - Bovine fetuses infected with so-called "non-CPE" BVD virus early in gestation can survive to term and beyond birth as persistently infected (PI) calves. They are thus a source of infection for the remainder of the herd.

By definition, a "closed herd" would have little opportunity for exposure to "outside" sources of BVD. Ingestion of feed contaminated with bovine neural tissue is a likely means of spreading bovine spongiform encephalopathy (BSE), but is not known to be a means of transmitting BVD. No role for roundworms as intermediate hosts for BVD has been shown. Co-mingling of dogs and cattle has been shown to transmit *Neosprum caninum*, but not BVD.
