

### Question

A clinician calls you about a heifer he examined and mentions that he heard a murmur over what he thought was the aortic region. Over which intercostal space would an aortic valve murmur be heard best?

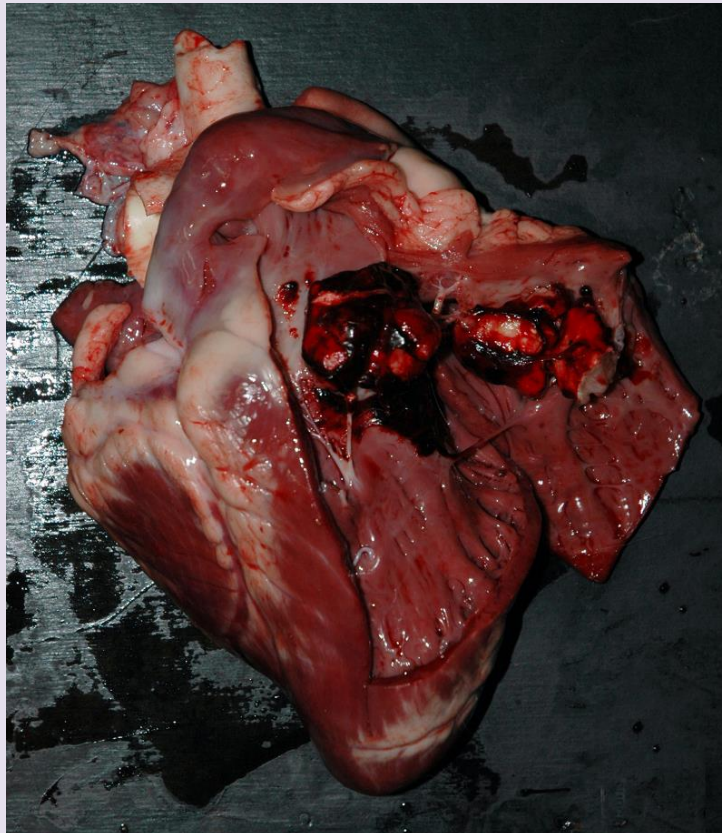
- Right 4th intercostal space
- Right 3rd intercostal space
- Left 4th intercostal space
- Left 5th intercostal space
- Left 3rd intercostal space

**Explanation** - The correct answer is the **left 4th intercostal space**. We at VetPrep always think of our left-handed ex-girlfriend PAM. That stands for Pulmonic, Aortic and Mitral and then you just work your way from the 3rd intercostal space (pulmonic) to the 5th intercostal space (mitral). So the point of maximal intensity for an aortic murmur will be on the 4th intercostal space. Keep in mind that this is all on the left side. On the right side the only valve you can appreciate is the tricuspid valve which is audible best between the 3rd and 4th intercostal space.

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### Question

A 3-year old Jersey heifer is not doing well and is put down with a post-mortem performed in the field. Below is an image of her heart, with the right atrium and right ventricle opened. What is your diagnosis?



- Cardiac neoplasia
- Tricuspid valve dysplasia
- Tricuspid valve endocarditis
- Ventricular septal defect

**Explanation** - The correct answer is **tricuspid valve endocarditis**. Hemorrhagic and white masses are seen on all leaflets of the tricuspid valve which makes endocarditis the most likely diagnosis in a **young heifer**. Neoplasia is unlikely on the valve and at this age; tricuspid valve dysplasia would be seen as short, thick chordae but no masses; a VSD would be seen as a hole between the right and left ventricle which is not apparent here.

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### Question

While performing a physical exam on a cow, you notice a rapid irregular heart rate with no atrial sounds or compensatory pauses. There is no regular rhythm to the irregularity. What is this?

- Bradyarrhythmia
- Atrial fibrillation
- Ventricular tachycardia
- Sinus arrhythmia

**Explanation** - This is descriptive for **atrial fibrillation**. If you ran an ECG, you would find **no P waves** and **variable intervals between QRS complexes**. Atrial fibrillation is a relatively common dysrhythmia in cattle. It is most commonly encountered **secondary to gastrointestinal disease**. Occasionally it is observed **secondary to painful conditions** including severe lameness. In cattle it is readily diagnosed during auscultation due to the extreme irregularity of the heartbeat. Other dysrhythmias that may be confused with atrial fibrillation during auscultation in cattle are sinus arrhythmia and premature atrial contractions. Clinical impression may sometimes distinguish these however an electrocardiogram is the only way to definitively diagnose the dysrhythmia.

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### Question

This cow in the picture presents for chemosis and oculonasal mucopurulent discharge. On physical exam, you note her to be sneezing, febrile, and having small white fibrinonecrotic plaques on her conjunctival and nasal mucosa. What is your diagnosis?



- Mannheimia hemolytica
- Moraxella bovis
- Calici virus
- Infectious bovine rhinotracheitis

**Explanation** - The correct answer is **infectious bovine rhinotracheitis**. The key clinical sign to make this diagnosis is the **white fibrinonecrotic plaques**. None of the other answer choices cause white fibrinonecrotic plaques.

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### Question

A 4 month old Holstein heifer has a loud cough, tachypnea, diarrhea, and ill thrift of 8 days duration. However, there are no signs of sepsis, depression, or loss of appetite. On physical exam, you could hear crackles and wheezes over the lung fields and a harsh bronchial tone cranioventrally. Given this presentation what is the most likely diagnosis?

- Moldy sweet potato poisoning
- Aspiration pneumonia
- Shipping Fever
- Enzootic pneumonia

**Explanation** - The correct answer is **enzootic pneumonia**. This disease is **multifactorial** but is mainly a result of poor housing and environment (**poor sanitation and ventilation**). Calves with enzootic pneumonia will have **cranioventral consolidation** and many times they have **diarrhea** as a result of being infected with **Eimeria bovis** (like this one).

Shipping fever (fibrinous pleuropneumonia) will most likely present with **more systemic** signs, which is key in differentiating the two diseases.

Aspiration pneumonia will probably not result in diffuse lung pathology without also causing systemic signs.

Moldy sweet potato poisoning is a good differential and will result in respiratory disease followed by death, but there was no history of exposure here. However, these animals will typically present with more acute respiratory distress and **will probably not survive for 8 days**, as death usually ensues 2-5 days after exposure. The principal toxin is **ipomeanol** which is produced by sweet potatoes infected with *Fusarium javanicum* or *F. solani*. Ipomeanol will destroy clara cells and type I pneumocytes.

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## Question

A 3 week old Guernsey calf presents with fever, anorexia, and depression. The calf had diarrhea and the owner had tube fed it several times a few days ago. On physical exam, you auscultate harsh lung sounds and crackles cranioventrally on both sides of the chest. Which of these is a likely differential?

- Aspiration pneumonia
- Fog fever
- Fibrinous pleuropneumonia
- Pneumothorax

**Explanation** - The correct answer is **aspiration pneumonia**. **Cranioventral lung disease** is the classical finding with aspiration pneumonia. If you think about it, you realize that if an animal inhales particulate matter, gravity will influence its path and thus there will be cranioventral involvement. Potential causes of aspiration pneumonia in calves include **leaking nipples from milk bottles, mineral oil drenches, pharyngeal paralysis** (due to **white muscle disease**), **gastric reflux, improper intubation**, and **hypoglycemia**.

A pneumothorax results in no audible lung sounds dorsally.

Fibrinous pleuropneumonia (shipping fever) is a good differential, however the clinical signs would be more severe and lung pathology **would be more diffuse**. For example, you will be able to hear crackles and wheezes in all areas, appreciate a soft cough, see nasal discharge, and at times, pleural rubs may be audible if there is pleural effusion or a septic pleuritis.

Fog fever is a respiratory disease of adult cows that results when they suddenly consume lots of lush pasture. At this point, the plants are high in **tryptophan** which is subsequently metabolized in the rumen to **3-methyl indole** (toxic to the lungs).

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### Question

A group of yearling steers were recently fed moldy sweet potatoes two days ago. Yesterday, they began to exhibit tachypnea, dyspnea, grunting, frothing at the mouth, deep cough, and respiratory distress. Today there are several dead. The lungs are wet, firm, and fail to collapse. Lobules are dark red and firm, with hemorrhages, edema, emphysema and bullae throughout the interstitial pneumonia. What is the cause of this disorder?

- 3-methylindole
- 4-ipomeanol
- Bovine respiratory syncytial virus
- Mannheimia hemolytica

**Explanation** - A metabolite of **4-ipomeanol** is a pneumotoxic compound that is produced by the fungus **Fusarium solani** acting on the sweet potato compound called 4-hydroxymyoporone. This metabolite is toxic to pulmonary tissues. Lesions are similar to those found with **acute bovine pulmonary edema and emphysema (ABPE)** caused by conversion of ingested L-tryptophan in lush pastures to pneumotoxic 3-methylindole.

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### Question

You are in the process of auscultating a cow that presented for respiratory distress and you hear no breath sounds in the dorsal chest. What is your tentative diagnosis?

- Pneumothorax
- Pulmonary contusion
- Fibrinous pleuropneumonia
- Aspiration pneumonia

**Explanation** - The correct answer is pneumothorax. Since there is free air in the chest, the lung has lost its vacuum and is collapsed. The free air moves dorsally and you are unable to hear any lung sounds.

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### Question

A 4 year old Beefmaster bull presents with frothy nasal discharge, subcutaneous emphysema, an infrequent loud cough, heart rate of 88, and open-mouthed breathing. Additionally, crackles and wheezes are audible throughout the lung fields. Radiographic findings show an interstitial pattern and no consolidation. You cannot detect any consolidation on physical exam either. Blood work shows no signs of sepsis. About two weeks ago this bull was moved from a poor pasture to a very lush pasture. What is your diagnosis?

- Fibrinous pleuropneumonia
- Fog fever
- Silo filler's disease

- Farmer's lung
- Bovine respiratory syncytial virus

**Explanation** - The correct answer is **fog fever**, also called **acute bovine pulmonary edema and emphysema**. It is one of the atypical interstitial pneumonias. The key to making this diagnosis is the history, but the clinical signs are important too. This bull has **atypical pneumonia** (diffuse, non-septic lung disease). This can be determined because there are no signs of sepsis, he has an intermittent loud cough as opposed to a soft, painful, cough, and he has widespread crackles and wheezes without consolidation. Given this, fibrinous pleuropneumonia (shipping fever) can be ruled out. BRSV may have similar signs but there is a characteristic "**honking**" cough which this bull does not have, and usually is only this severe in young animals. Now you can rule out farmer's lung and silo filler's disease. This is where the history is especially important. With farmer's lung, the animal will have allergies, so his signs will be **episodic**. Usually, the animal will be housed indoors and be exposed to the allergen; going outside will improve his situation. With silo filler's disease (bronchiolitis obliterans) there is typically a history of the animal being housed close to the silo which often results in inhalation of toxic silo gases. Finally, there is the history of switching from a poor pasture to a lush pasture two weeks ago. This is classic for fog fever. The lush plants are high in tryptophan which is subsequently metabolized in the rumen to 3-methyl indole (toxic to the lungs).

## ABPE

- Usually adult cattle
- 5-10 days after change to lush grass pasture (usually fall)
- L-tryptophan converted to 3-methylindole in rumen
- 3-methylindole converted to pneumotoxin in lungs
- Severe pulmonary edema and emphysema
- Emphysema may extend to SQ tissue
- 50% morbidity
- Variable mortality (can be high)





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### Question

A herd of cattle present for an acute onset of a mild cough. Many of the cattle subsequently die and the others have improved over the course of several days. The cattle had a history of being moved to a lush pasture. Necropsy findings showed acute interstitial pneumonia and air filled bullae. What is the likely chemical responsible for this disease?

- 4-Ipomeanol
- Methylmethacrylate
- Magnesium
- 3-Methylindole

**Explanation** - The correct answer is 3-methylindole. Cattle that are moved to lush forage that is high in tryptophan metabolize the tryptophan to 3-methylindole in the rumen. The 3-MI is toxic to the lung, resulting in acute interstitial pneumonia and emphysema. This syndrome is known as acute bovine pulmonary edema and emphysema (ABPEE), fog fever or grunts. 4-Ipomeanol is the chemical involved in moldy sweet potato poisoning, which looks clinically similar to this.

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### Question

A 7 year old Jersey cow presents to you with anorexia, bottle jaw, brisket edema, and a true jugular pulse. She has a heart rate of 90 bpm, rapid respiration, and is depressed. What is your primary differential?

- Generalized lymphangitis
- Anaplasmosis

- Right heart failure
- Salt poisoning

**Explanation** - The correct answer is right heart failure. As a result of an inability to pump blood, it backs up and edema and a true jugular pulse occur.

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### Question

A 2 year old Holstein dairy cow presents for lethargy, anorexia, and decreased production. On physical exam, the cow has a temperature of 104.5F, a respiratory rate of 68 bpm, a heart rate of 90 bpm, muffled heart sounds that have a distinct washing machine sound of splashing and dripping, heard best on the left side. The jugular veins are prominent. What is your tentative diagnosis?

- Heart base lymphoma caused by bovine leukosis virus
- Endocarditis of the tricuspid valve
- Advanced traumatic reticulopericarditis
- Ventricular septal defect

**Explanation** - The murmur results from development of **pericarditis** and may be described as a washing machine murmur. It results when there is a fluid-gas interface in the pericardial sac. The heart sounds are muffled because of the thickened and fluid filled pericardial sac.

Tricuspid endocarditis would result in a loud right sided murmur.

A ventricular septal defect would have a loud systolic or constant murmur heard on either side.

A heart base tumor could cause muffled heart sounds but would not have the washing machine sounds and would be unlikely in a 2 year old cow (usually BLV lesions occur in older cattle).

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### Question

A 2 year old dairy heifer presents with a stiff walk and arched back. On physical exam, the heifer has fever of 104F, a "washing machine" murmur, distended jugular veins, and a positive grunt test (pain when you apply upward pressure in the xiphoid region). What is the most likely diagnosis?

- Cor Pulmonale
- Traumatic reticulopericarditis
- Ventricular septal defect
- Endocarditis

**Explanation** - The correct answer is traumatic reticulopericarditis. This is a classic presentation. The washing machine murmur is due to the presence of both fluid and gas in the pericardium resulting in splashing and dripping sounds. Right heart failure is usually a component of traumatic reticulopericarditis. You will see a jugular pulse, distended jugular veins, and brisket edema with

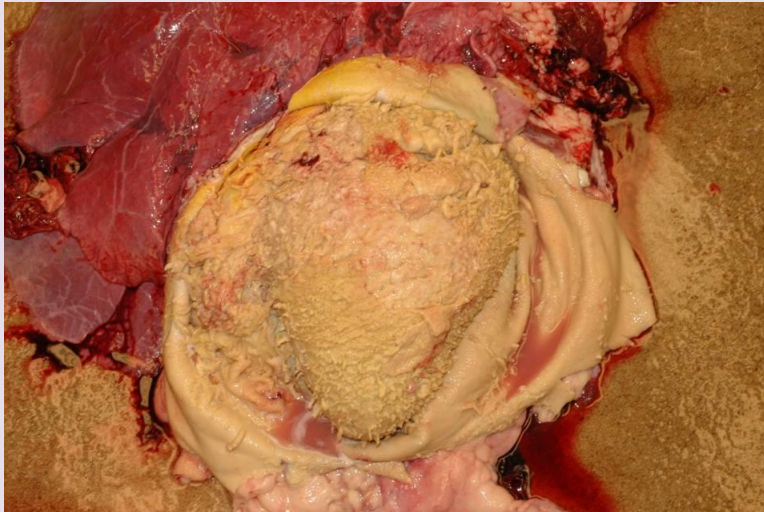


right heart failure. The prognosis is poor. Prevention is best achieved by giving all cows over 500lbs a magnet and keeping them away from wires (using string baling twine) and other metallic objects that could be ingested.

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### Question

Which of the following is the most common cause of pericarditis in cattle as shown in the photograph?



- Clostridium perfringens
- Haemophilus
- Traumatic reticuloperitonitis
- Stephanurus edentatus
- Streptococcus

**Explanation** - The correct answer is hardware disease (traumatic reticuloperitonitis). Cattle ingest wires which then perforate the reticulum and migrate into the pericardium and cause an infection. **In small ruminants, Clostridium perfringens will cause pericarditis.** In swine, pericarditis may be caused by haemophilus, streptococcus, and Stephanurus edentatus.

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### Question

A dairyman calls to say he has lost several 5 week old calves to acute respiratory signs in the last week. The calves have fever, depressed attitude, decreased appetite, cough and nasal discharge. They do not seem to respond to antibiotic therapy and may die within a few days. On postmortem of one, you find the lungs fail to collapse when the thorax is opened (see image), and they have interstitial emphysema and a rubbery consistency. You believe this is most likely caused by Bovine Respiratory Syncytial Virus (BRSV). What should now be recommended for the herd?



- Intratracheal use of antiviral drugs in all affected calves
- Vaccination of all calves against IBR
- Vaccination of all calves against BRSV
- Metaphyllaxis of all calves from birth with tetracycline IM every 3 days
- Vaccination of all calves against BVD

**Explanation** - **Vaccination of all calves against BRSV**. Until the calves have time to develop immunity, new animals should be raised apart from and isolated from the current group of calves where the virus is circulating. Treatment of individual calves affected by BRSV may include antimicrobial drugs and NSAIDs; some veterinarians advocate the use of corticosteroids if pulmonary edema is severe.

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### Question

You are presented with a 6 month old Saler bull which is depressed, off feed, and breathing hard. He was shipped to the new farm 7 days previously. On physical exam, you find T=105F, HR=80, RR=45, and the scleral vessels are injected and dark. The animal is dyspneic and open-mouth breathing (see image). The cranioventral lung fields auscult abnormally, with harsh inspiratory and expiratory sounds as well as expiratory wheezes. Percussion of the thorax reveals ventral consolidation. Which of the following is the most likely correct diagnosis?



- Mannheimia hemolytica bronchopneumonia
- Atypical interstitial pneumonia
- Dictyocaulus viviparus infestation
- Pneumothorax
- Caudal vena caval thrombosis syndrome

**Explanation** - These signs are typical of bovine bronchopneumonia caused by Mannheimia hemolytica and associated with shipping fever.

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### Question

Which of the following is not a feature of Tetralogy of Fallot?

- Dextropositioned aorta
- Right ventricular hypertrophy
- Pulmonic valve stenosis
- Ventricular septal defect
- Aortic valve stenosis

**Explanation** - The correct answer is aortic valve stenosis. Excellent job if you remembered this one! In case you don't remember the four features of Tetralogy of Fallot, they are: Right ventricular hypertrophy, ventricular septal defect, dextropositioned aorta (over-riding aorta), and

pulmonic valve stenosis. Clinical signs include a bilateral basilar murmur, right sided heart failure, cyanosis, and secondary bacterial endocarditis.

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### Question

A cow presents to you as a result of decreased milk production. On physical exam you determine the cow has a much stronger pulse on expiration than she does on inspiration. What is this pulse associated with?

- Atrial premature contractions
- Patent ductus arteriosus
- Pericardial effusion
- Atrial fibrillation

**Explanation** - The correct answer is **pericardial effusion**. Pulsus paradoxus is an exaggeration of normal variations in the pulse during respiration, in which the pulse becomes weaker as one inhales and stronger as one exhales. It is characteristic of **constrictive pericarditis** or **pericardial effusion**.

Atrial premature contractions are more likely to result in pulse deficits. Atrial fibrillation is likely to result in pulsus alternans, in which you see two quick normal pulses in a row followed by no pulse. A patent ductus arteriosus usually is found only in very young animals and results in waterhammer pulses which is a large bounding pulse with a sharp peak and very rapid decline.

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### Question

Several cattle in a herd of 463 have a loud hacking cough, sneezing, fever, anorexia, open mouth breathing, and mucopurulent nasal discharge. On physical exam, white plaques are noticed on the conjunctiva and nasal epithelium. Additionally, their noses are very hyperemic. After obtaining a thorough history, it was determined that several abortions have occurred since the cattle started showing clinical signs. What is your top differential?

- Bovine respiratory syncytial virus
- Bovine viral diarrhea
- Mannheimia hemolytica
- Infectious bovine rhinotracheitis

**Explanation** - The correct answer is infectious bovine rhinotracheitis. The clinical signs are very typical. IBR will cause these classic upper respiratory tract signs with **white plaques**. BRSV will lead to atypical pneumonia with a "**honking**" cough. BVD can lead to respiratory disease but you will observe **ulceration of the mouth**, not nasal plaques.

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### Question

In mid-autumn you attend a group of 64 housed beef cattle aged 9-12 months, purchased from numerous markets over the previous 3 weeks. Frequent coughing has been heard in the group

over the past week. The farmer has selected two inappetent animals with purulent ocular and nasal discharges for veterinary examination. Clinical examination reveals pyrexia 105.4 and 106.0F. The respiratory rate is increased and auscultation of the chest reveals referred upper respiratory tract noise. Visual inspection of the remainder of the group reveals a number of cattle with mucopurulent ocular and nasal discharges and tachypnea as well as several cows who have a swollen vulva with erosions and ulcers. Six animals are selected and examined, all of which have a rectal temperature > 105 F. What is the best way to confirm your presumptive diagnosis?



- Viral isolation of nasal swab
- Bacterial culture of nasal swab
- Fungal culture of nasal swab
- Baermann evaluation of a fecal sample

**Explanation** - The case is strongly suggestive of **infectious bovine rhinotracheitis (IBR)** based on the clinical course. Diagnosis can be made from **viral isolation of nasal or ocular swabs** from live animals or from bronchial lymph nodes or tracheal tissue in deceased animals. Serology 2-3 weeks apart can also confirm a diagnosis of IBR.

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### Question

You examine a 4-year old dairy cow which has markedly decreased in milk production over the last lactation, and find T=103F, HR=100/min, brisket edema (see photo) and enlarged/dilated jugular veins. The heart is muffled and you hear occasional splashing sounds. You tell the farmer the cow most likely has \_\_\_\_\_.





- Hereditary cardiomyopathy
- Gossypol toxicity
- Endocarditis
- Traumatic reticulopericarditis
- Heart base tumor (lymphoma)

**Explanation** - The clinical signs all lead to the fact that this cow has heart failure. The main causes are pericarditis, endocarditis, heart base lymphoma, and hereditary muscle disorders. Calves also suffer from gossypol toxicity with heart failure. The muffled splashy heart sounds lead to **traumatic reticulopericarditis**, associated with a metallic foreign body which pierced the reticulum.

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### Question

You are in the process of performing an ECG on a Charolais cow with chronic pulmonary disease and notice that the P wave is tall and slender and measures 0.48mV ( normal <0.4 mV), a condition known as P pulmonale. What conclusion as to the nature of the cardiac abnormality can you make from this finding?

- Left atrial enlargement
- Right atrial enlargement
- Left ventricular enlargement
- Congestive heart failure



**Explanation** - The correct answer is **right atrial enlargement**. This ECG finding is known as P pulmonale and is characterized by tall slender peaked P waves greater than 0.4mV. Many times these patients have a history of chronic pulmonary disease.

Left atrial enlargement on an ECG is known as P mitrale. In this case, an increase in duration of the P wave is seen. Usually they will last at least 0.05 seconds. The reason you see these electrical changes is because of the resulting vectors that are produced by having a certain portion of the heart enlarged.

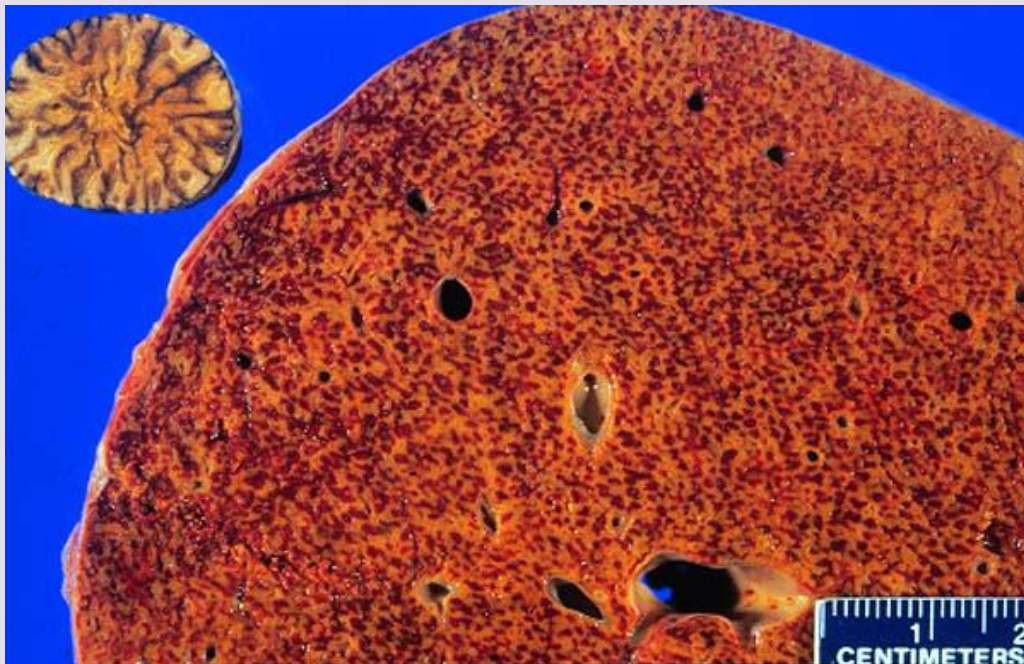
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### Question

When performing a necropsy on a cow, you find multiple abnormalities including abomasal ulcers, interstitial pneumonia, pericardial effusion, and mastitis. You also see that the liver has a brown-(tan) and red-mottled lobular pattern described as a nutmeg liver. Which of these conditions in the cow could lead to the necropsy findings in the liver?

- Pericardial effusion
- Interstitial pneumonia
- Abomasal ulcers
- Mastitis

**Explanation** - The appearance of a nutmeg liver occurs because there are red central veins and sinusoids between tan areas of swollen hepatocytes. This occurs with **right sided heart failure** from passive congestion of the sinusoids of hepatocellular hypoxia. Pericardial effusion causes right sided heart failure and is the cause of the liver's appearance.



### Question

What cardiac abnormality is commonly associated with hypocalcemia and milk fever in the cow?

- Sinoatrial node block
- Ventricular premature contractions
- Tachycardia
- Atrial fibrillation

**Explanation** - The correct answer is **tachycardia**. Calcium administration may cause all the other abnormalities if you give too much too fast. You may also see a sinus node arrest. Calcium administration will cause the heart to beat more slowly and more strongly.

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### Question

A 7-month old feedlot steer has died after exhibiting severe fever, dyspnea, cough and respiratory distress. On post mortem there is evidence of fibrinopurulent bronchopneumonia (see image). What bacterium is most likely to be the cause of this syndrome?



- *Pasteurella multocida*
- *Mycoplasma bovis*
- Bovine herpes virus type 4
- *Mannheimia hemolytica*
- *Arcanobacterium pyogenes*

**Explanation** – The correct answer is *Mannheimia hemolytica*. Other agents may also be isolated, but this is recognized as the worst pathogen in bovine pulmonary disease. It was formerly called *Pasteurella hemolytica*.

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### Question

A cow presents due to a decrease in milk production. On physical exam, you were unable to hear the heart clearly (it is muffled). You decide to perform an ECG and immediately recognize that this cow has electrical alternans. What is most likely to be occurring?

- Pericardial effusion
- Right atrial enlargement
- Left ventricular enlargement
- Left atrial enlargement
- Right ventricular enlargement

**Explanation** - The correct answer is **pericardial effusion**. Electrical alternans is a classic finding in cases where there is pericardial effusion. Electrical alternans is characterized by different amplitudes of multiple successive R waves in the QRS complex. This is thought to be a result of the heart shifting around within the fluid filled compartment of the pericardial sac.

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### Question

You are presented with a 5 week old female Jersey calf with fever, tachypnea, tachycardia, lethargy, poor appetite and dyspnea. On auscultation, the ventral thorax is bilaterally harsh on both inspiration and expiration, with wheezes, crackles and popping sounds. The lateral view radiograph of the thorax is shown. What can be determined from the radiograph?



- The cardiac shadow is enlarged
- There is a large volume of fluid in the thoracic cavity
- The middle sized and large airways are open and normal
- There is severe ventral consolidation of the lung
- There is a pneumothorax and the lungs have collapsed

**Explanation** - This is a radiograph of severe pneumonia in a calf with air bronchograms in the ventral lung fields. Air bronchograms indicate consolidation of the ventral lung. On exam of this calf, you would expect the lung to percuss dull ventrally, and be meaty and consolidated on post mortem.

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