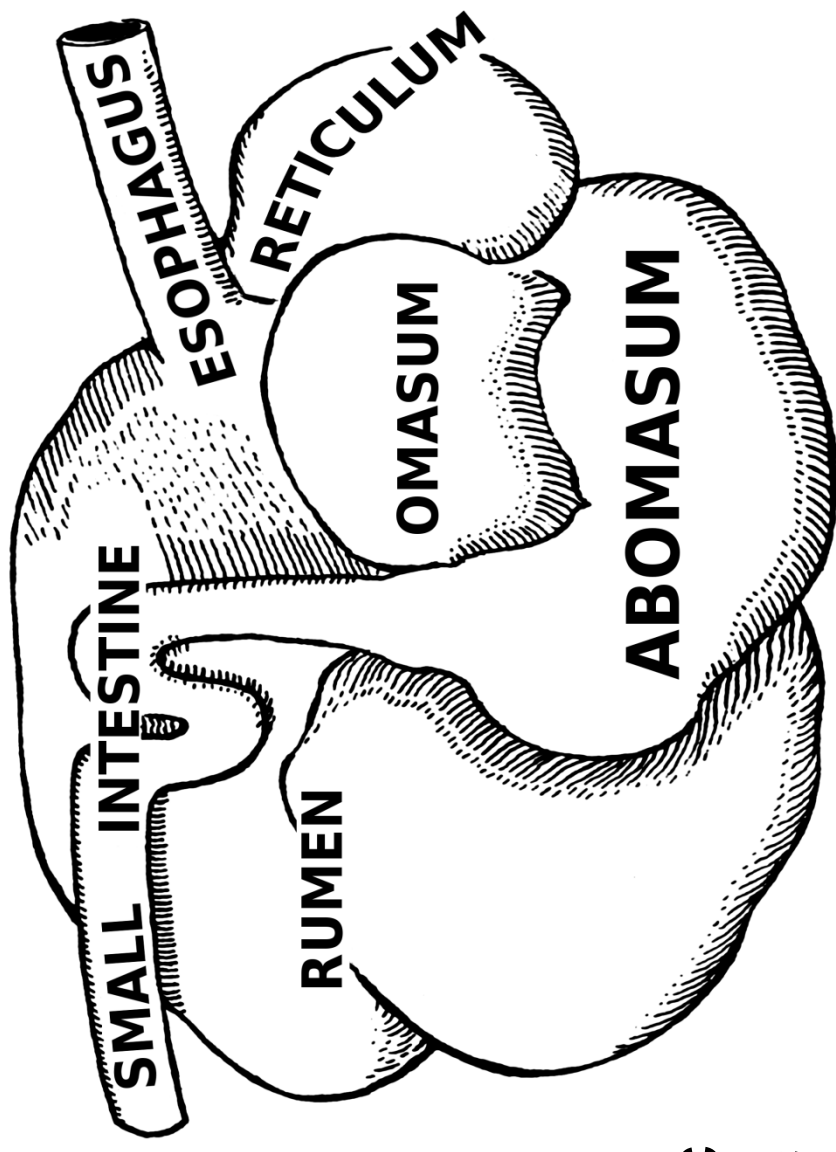


**Diseases of the Alimentary
Tract of Large Animals**



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Forestomach



Reticulorumen

Reticuloomasal
orifice

Omasum

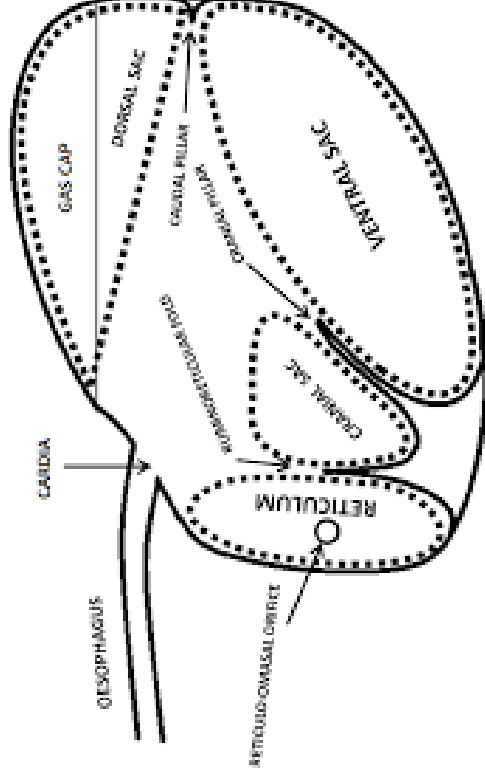
- Both parasympathetic and sympathetic nerves supply the reticulorumen

RETICULORUMEN MOTILITY

1. Primary or mixing cycle
2. Secondary or eructation cycle
3. Rumination (associated with cud chewing and associated with the primary cycle)
4. Esophageal groove closure (associated with sucking of milk)

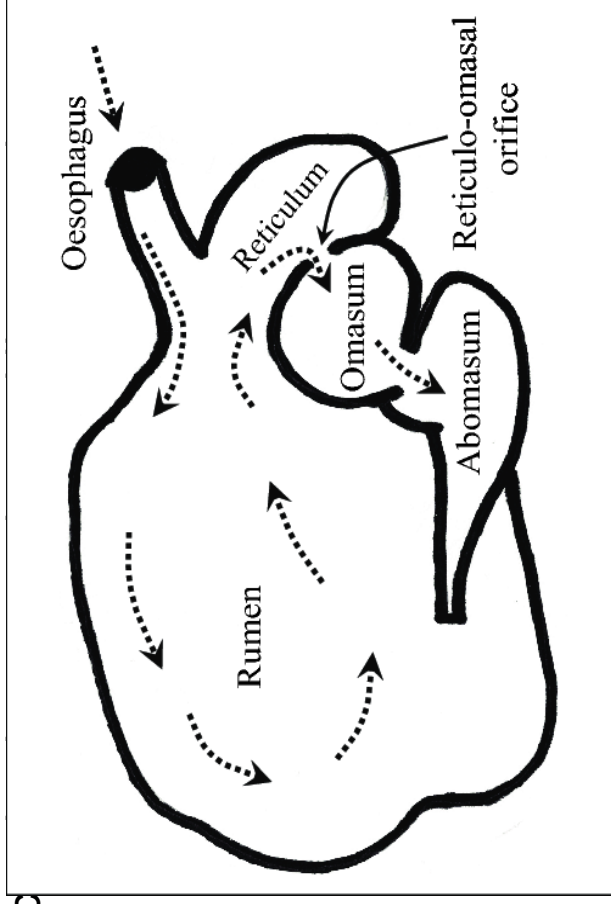
Primary Contraction Cycle

- Mixing and circulation of digesta in an organized manner
- Begins with a **biphasic contraction of the reticulum**
- The first reticular contraction forces ingesta dorsal and caudad into the rumen
- The dorsal ruminal sac then begins to contract as the ventral sac relaxes
- Causing digesta to move from the dorsal to the ventral sac
- Sequential contractions of the caudoventral, caudodorsal, and ventral ruminal sacs force digesta back into the reticulum and cranial sac
- After a brief pause the contraction sequence is repeated



- During each reticular contraction fluid and food particles
- Particularly heavy grain, pass into the reticuloomasal orifice and into the omasum and abomasum
- Stratification of ruminal contents
- To pass through the reticuloomasal orifice
 - 1-2 mm in sheep
 - 2-4 mm in cattle
- Auscultation and observation of the left paralumbar fossa
- The normal rumen feels doughy in the dorsal sac and more fluid ventrally
- Lactic acidosis, vagal indigestion, ileus, or prolonged anorexia
- Normal crescentic fluid splash

Fluid-splashing sounds



Control of Primary Contractions



Vagus
center

The Vagus
nerve

- Initiated
- Monitored
- Controlled

Excitatory Inhibitory

- Direct depression of the gastric center
- Absence of excitatory inputs
- Increase in excitatory inhibitory inputs
- Failure of vagal motor pathway

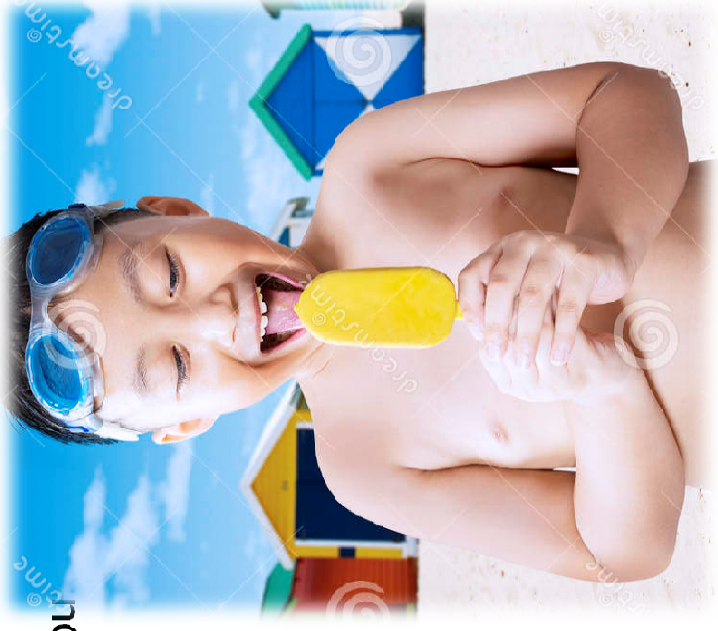
Properties of Contractions

- Frequency provides a rough estimate of the overall health of a ruminant
- Frequency of primary contractions averages 60 cycles per hour
- 50 cycles per hour during rumination
- Even lower when the cow is recumbent
- Feeding increases the rate to up to 105 cycles per hour
- Auscultate the rumen for at least 2 minutes
- The strength of contraction
 - Movement of the left paralumbar fossa
 - Assessing the loudness of any sounds associated with ruminal contraction



Excitatory Inputs to the Gastric Center

- Tension and chewing movements
- Low-threshold tension receptors
- Deep in the circular smooth muscle layer detect reticulorumen distension
- The greatest density of receptors is found in the medial wall of the reticulum and dorsal ruminal sac
- Prolonged anorexia decreases this excitatory input
- Feeding increases reticulorumen
- Buccal receptors
- The sight of feed
- Milking
- Environmental cold
- Decrease in abomasal pH



Inhibitory Inputs to the Gastric Center

- **Fever**
- **Endotoxemia**
 - a prostaglandin-associated mechanism
 - a temperature-independent mechanism
- **Pain**
 - Catecholamine release
 - Sympathetic nervous system
- **Moderate to severe forestomach distension**
- Epithelial receptors
 - Ruminal pillars
 - Papillae of the reticulum
 - Cranial rumen sac
- High-threshold tension receptors
- Severe rumen distension
- **Ruminal Volatile Fatty Acids**
- *Abomasal Disease*
- *Effect of Depressant Drugs*
- *Acid-Base Imbalance and Blood Glucose*
- *Hormonal Control of Primary Contractions*
- Cholecystokinin and gastrin can reduce feed intake and forestomach motility
 - Sheep with certain intestinal nematodes



Secondary Cycle Contraction and Eructation

- Secondary cycles are contractions that involve only the rumen and are associated with the **eructation of gas**
- They occur independently of the primary cycle contractions and usually less frequently (about once every 2 minutes)
- The contraction rate depends on the gas or fluid pressure in the dorsal sac of the rumen
- Secondary cycles can be inhibited by severe distension of the rumen
- Ruminant contractions are essential for eructation
- Tension receptors in the medial wall of the dorsal ruminal sac initiate the reflex by means of the dorsal vagus nerve
- Contractions begin in the dorsal and caudodorsal ruminal sacs and spread forward to move the gas cap ventrally to the cardia region
- Contraction of the reticuloruminal fold is necessary to stop fluid from moving forward to the reticulum and covering the cardia
- Receptors in the cardia region detect the presence of gas
- The cardia remains firmly closed if fluid or foam (as in frothy bloat) contacts it
- Despite the presence of normal secondary contractions, eructation may not occur in recumbent animals
- Bloat is often observed in ruminants in lateral recumbency
- Eructation occurs after the animal stands or attains sternal recumbency

- Bloat can also result from peritonitis, abscesses or masses that distort the normal forestomach anatomy
- Preventing active removal of fluid from the cardia region
- Esophageal obstructions associated with intraluminal, intramural, or extraluminal masses are a common cause of free gas bloat
- Bloat is often observed in cattle with tetanus
- Ruminant esophagus is composed of striated muscle throughout its length
- Persistent mild bloat is often observed in ruminants that have rumen atony or hypomotility secondary to systemic disease
- Although the fermentation rate is lower than normal in these cases, ruminal contractions are not strong enough to remove all the gas produced
- Secondary contractions are relatively autonomous and are not subject to the same central excitatory and/or inhibitory
- Agents that inhibit reticulorumen motility by a central action have a lesser effect on eructation than on primary contraction cycles
- However, high doses of xylazine can inhibit secondary contractions, and the duration of inhibition is dose dependent.
- No drugs are yet available to improve secondary contractions as a means of treating bloat

Rumination

- Rumination is a complex process and consists of the following:
 - Regurgitation
 - Remastication
 - Insalivation
 - Deglutition
- Rumination is initiated by the rumination center
- Close to the gastric center in the medulla oblongata
- Rumination allows further physical breakdown of feed with the addition of large quantities of saliva
- The time devoted to rumination is determined by the coarseness of ruminal contents and the nature of the diet
- Rumination usually commences 30 to 90 minutes after feeding
- Proceeds for 10 to 60 minutes at a time, resulting in up to 7 hours per day spent on this activity
- The epithelial receptors located in the reticulum, esophageal groove area, reticulorumen fold, and ruminal pillars
- Detect coarse ingesta and initiate rumination
- The receptors can be activated by increases in volatile fatty acid concentration, stretching, and mechanical rubbing

- Regurgitation is associated with an extra contraction of the reticulum immediately preceding the normal reticular biphasic contraction of the primary cycle
- The glottis is closed, and an inspiratory movement lowers the intrathoracic pressure
- The cardia then relaxes, and the distal esophagus fills with ingesta
- Reverse peristalsis moves the bolus up to the mouth in which it undergoes further mastication
- The usual causes for a reduction or absence of rumination are :
 - Reticulorumen hypomotility or atony
 - Central nervous system depression
 - Excitement, pain, or both
 - Liquid ruminal contents such as a high-concentrate diet with no coarse fiber
 - Mechanical injury to the reticulum (peritonitis)
- Chronic emphysema (difficulty in creating a negative thoracic pressure)
- Extensive damage to the epithelial receptors that incite the reflex, as occurs in rumenitis
- Milking commonly elicits rumination in cows and goats.

Treatment of Forestomach Hypomotility

- Anorexia and forestomach hypomotility usually exist together
- Ruminatorics such as nux vomica, gentian, and tartar given orally have not been effective
- Ginger shows potential promise as a prokinetic in cattle
- Parasympathomimetics, such as neostigmine or carbamylcholine, should not be used to treat forestomach atony
- Neostigmine requires vagal activity to be effective and therefore cannot incite normal primary contractions in atonic animals
- Neostigmine may increase the strength of a primary contraction without altering rhythm or coordination
- Carbamylcholine causes hypermotility in sheep, but the contractions are uncoordinated, spastic, and functionless

SIMPLE INDIGESTION

- Indigestion is common in stall-fed dairy cattle
- The variability in quality and the large amounts of feed consumed
- Indigestible roughage, particularly when the protein intake low
- Moldy, overheated, and frosted feeds
- Moderate excesses of grain and concentrate intake

- Indigestible roughage
 - Straw
 - Bedding
 - Scrub fed
- Limitation of the available drinking water during dry seasons
- Depraved appetite
- Unlimited access to good-quality ensilage
- 45 to 50 kg of ensilage daily
- Oral dosing with antimicrobials
- Feeding of a special diets (high content of polyunsaturated fats)

Pathogenesis

- Primary atony
- Changes in the pH of its contents markedly affect the motility of the rumen
- Grains
- High-protein diets
- Feeding of excessively large quantities of legumes or urea
- The simple accumulation of indigestible food may physically impede ruminal activity
- Putrefaction of protein may also play a part in the production of atony
- The toxic amides and amines produced may include histamine, which is known to cause ruminal atony
- Histamine may contribute to the ruminal atony
- A marked fall in milk yield occurs, caused probably by the sharp decrease in volatile fatty acid production in a hypotonic reticulorumen
- Decreased food intake is probably caused by the ruminal hypomotility or atony

Clinical findings

- A reduction in appetite
- In milking cows by a slight drop in milk production
- The anorexia may be partial or complete but the fall in milk yield is relatively slight
- The animal's posture is unaffected
- Mild depression and dullness
- Rumination ceases and the ruminal movements are depressed in frequency and amplitude
- The rumen may be larger than normal if the cause is sudden access to an unlimited supply of palatable feed
- There may be moderate tympany, especially with frozen or damaged feeds or in allergy
- Commonly a firm, doughy rumen without obvious distension
- The feces are usually reduced in quantity and are drier than normal on the first day
- 24 to 48 hours later the animal is commonly diarrheic
- The feces are softer than normal, voluminous, and commonly malodorous
- There is no systemic reaction
- The heart rate, temperature, and respirations are usually within normal ranges
- Pain cannot be elicited by deep palpation of the ventral abdominal wall
- Most cases recover spontaneously or with simple treatments in about 48 hours

CLINICAL PATHOLOGY

- Examination of the urine for ketone bodies
 - Assess the activity of the ruminal microflora
- The sediment activity test**
- The time in normal animals varies between 3-9 minutes

The cellulose digestion test

- Digestion times in excess of 30 hours

The rumen fluid pH

- Values between 6.5 and 7.0
- In cattle on grain diets, the pH may range from 5.5 to 6.0 normally

TREATMENT

- Most cases of simple indigestion recover spontaneously
- Small quantities of fresh, good-quality, palatable hay should be provided several times daily to encourage eating and to stimulate reticulorumen motility

Rumenatorics

- nux vomica, ginger, and tartar emetic
- Ginger may be an effective prokinetic agent in ruminants
- Ginger extract (40 mg/kg body weight [BW])

Parasympathomimetics

- Carbamylcholine chloride, physostigmine, and neostigmine

Metoclopramide increases the rate of ruminal contractions

Alkalinizing and Acidifying Agents

- Magnesium hydroxide, at the rate of 400 g per adult cow (450 kg BW)
- Acetic acid or vinegar, 5 to 10 L, is used when the rumen contents are alkaline as a result of the ingestion of high-protein

Reconstitution of Ruminant Microflora (Rumen Transfaunation)

- Animals that have been anorexic for prolonged periods
- Reconstitution of the flora by the use of rumen fluid transfers from healthy cows is highly effective
- An abattoir is the best source of rumen contents (especially rumen fluid)
- At least 5 L of rumen fluid should be transferred
- Repeated daily dosing is advisable
- Commercial products comprising dried rumen solids are available and provide some bacteria and substrate for their activity when reconstituted with warm water at 37°C
- Good-quality alfalfa (lucerne) or clover hay, green feed, and concentrate may be added to the diet as the appetite improves

Acute Carbohydrate Engorgement of Ruminants

- Ruminant lactic acidosis
- Rumen overload
- Subacute ruminal acidosis (SARA)



Etiology

- Sudden ingestion of toxic doses of carbohydrate-rich feed (grain)
- Engorgement with apples
- Grapes
- Bread
- Baker's dough
- Sugar beet, Potatoes
- Concentrated sucrose solutions
- Unripe green corn standing in the field

- Wheat, barley, and corn grains are the most toxic
- Oats and grain sorghum are least toxic
- All grains are more toxic when ground finely or even crushed or just cracked
- Amounts of feed that are lethal to cattle
- 25 to 62 g/kg BW of ground cereal grain
- 50 to 60 g/Kg undernourished sheep



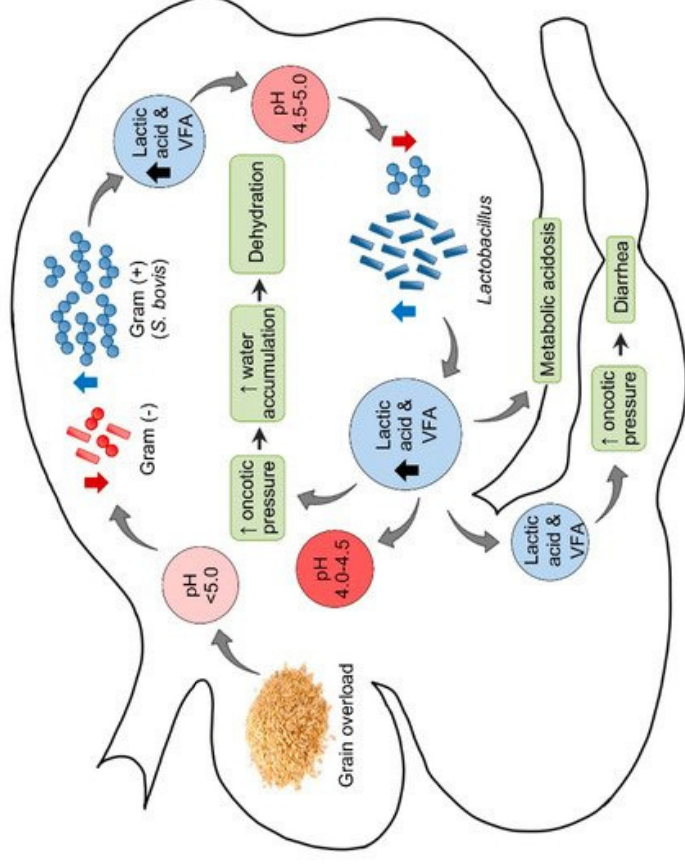
PATHOGENESIS

Changes in Rumen Microflora

- The ingestion of excessive quantities of highly fermentable
- Within 2 to 6 hours by a marked change in the microbial population
- *Streptococcus bovis*, which use the carbohydrate to produce large quantities of lactic acid
- Decreases the rumen pH to 5 or less
- Destruction of the cellulolytic bacteria and protozoa

Volatile Fatty Acids and Lactic Acid in the Rumen

- The concentration of volatile fatty acids increases initially, contributing to the fall in ruminal pH
- The low pH allows lactobacilli to use the large quantities of lactic acid
- Produce excessive quantities of lactic acid
- Resulting in ruminal lactic acidosis
- Both D- and L- forms of the acid are produced
- Markedly increases ruminal osmolality from a normal of 280 mOsm/kg to almost 400 mOsm/kg
- Water is drawn in from the systemic circulation, causing hemoconcentration and dehydration



- Some of the lactic acid is buffered by ruminal buffers
- Large amounts are absorbed by the rumen
- Some moves into and is absorbed further down the intestinal tract
- Lactate is a 10 times stronger acid than the volatile fatty acids
- As the ruminal pH declines
- The amplitude and frequency of the rumen contractions are decreased
- At about a pH of 5 there is ruminal atony
- The increased concentration of undissociated volatile fatty acids thought to be more important
- Diarrhea is thought to be osmotic
- Renal blood flow and glomerular filtration rate are also decreased
- Anuria
- Eventually there is shock and death
- All these events can occur within 24 hours after engorgement



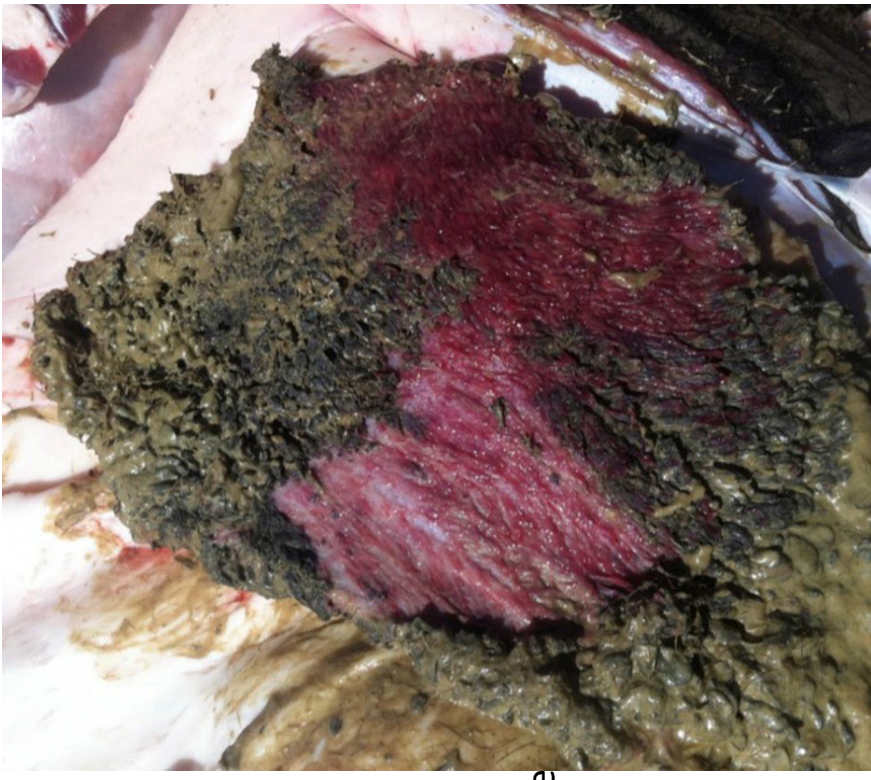
Diarrhoea in acidosis

Systemic Lactic Acidosis

- The absorbed lactic acid acts as a strong anion
- When absorbed in sufficiently large enough amounts results in a decreased strong ion difference
- A strong ion acidosis and acidemia
- L-lactate is rapidly metabolized to bicarbonate
- Increasing the plasma strong ion difference and increasing blood pH toward the normal range
- D-lactate is very slowly metabolized
- D- α -hydroxy acid dehydrogenase
- Plasma concentrations decrease primarily by renal excretion
- In severe cases of lactic acidosis the reserves of plasma bicarbonate are reduced
- The blood pH declines steadily
- The blood pressure and renal blood flow decline
- Causing a decrease in perfusion pressure and oxygen supply to peripheral tissues
- This results in a further increase in lactic acid from cellular respiration and decreased elimination of d-lactate in the urine

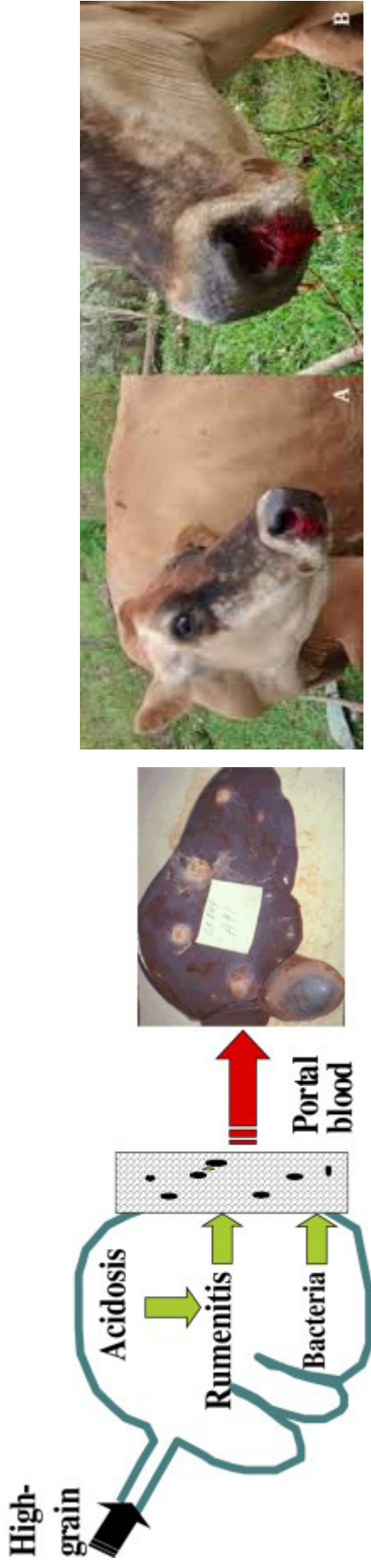
Chemical and Mycotic Rumenitis

- The high concentration of lactic acid causes chemical rumenitis
- Precursor for mycotic rumenitis in those that survive
- This occurs about 4 to 6 days later
- The low pH of the rumen favors the growth of *Mucor*, *Rhizopus*, and *Absidia* spp
- Invade the ruminal vessels
- Causing thrombosis and infarction
- Severe bacterial rumenitis also occurs
- Widespread necrosis and gangrene may affect the entire ventral half of the ruminal walls
- Lead to the development of an acute peritonitis
- The damage to the viscus causes complete atony
- Together with the toxemia resulting from the gangrene
- Sufficient to cause death
- Chronic rumenitis and ruminal parakeratosis are common in cattle fed for long periods on grain rations



Hepatic Abscesses

- In uncomplicated chemical rumenitis
- Ruminal mucosa sloughs and heals with scar tissue
- Hepatic abscesses commonly occur as a complication as a result of a combination of rumenitis
- *Fusobacterium necrophorum*
- *Trueperella pyogenes* (Arcanobacterium or Corynebacterium)
- Enter directly into ruminal vessels
- Spread to the liver
- Severe diffuse coagulation necrosis and hyperplasia of the bile duct epithelium and degeneration of renal tubules
- A small proportion of cattle with hepatic abscesses proceed to develop **caudal vena caval syndrome**



Laminitis/ Founder Disease/

Pododermatitis Aseptica Diffusa

- Laminitis occurs in acute, subclinical, and chronic forms
- Associated with altered hemodynamics of the peripheral microvasculature
- Vasoactive substances are released during
 - The decline of rumen pH
 - The bacteriolysis
 - Tissue degradation
- Vasoconstriction and dilatation
- Injure the microvasculature of the corium
- Ischemia results
- Reduction in oxygen and nutrients reaching the extremities of the corium and cell swelling
- Ischemia causes physical degradation of junctures between tissues
- Cell swelling within an enclosed noncompliant structure such as the hoof can result in further decrease in blood flow within the digit
- Manifestations of subclinical laminitis are sole hemorrhages and yellowish discoloration
- Double soles, heel erosion, dorsal wall concavity, and ridging of the dorsal wall
- Increased concentrations of histamine
- Endotoxin, ethanol, and methanol



Arched back in severe lameness

Polioencephalomalacia

Thiaminase I

- *Bacillus thiaminolyticus*
- *Clostridium sporogenes*

Thiaminase II

- *Bacillus aneurinolyticus*

D-lactic acid

- cross the blood-brain barrier by monocarboxylate protons transporters



CLINICAL FINDINGS

Speed of Onset and Severity

- More rapid with ground feed than with whole grain
- Severity increases with the amount of feed eaten

Within a few hours after engorgement

- Distended rumen and abdomen
- Occasionally some abdominal discomfort
- Kicking at the belly

In mild form

- Anorexic
- Fairly bright and alert
- Feces may be softer than normal
- Rumen movements are reduced but not entirely absent
- Affected cattle do not ruminate for a few days
- Usually begin to eat on the third or fourth day without any specific treatment

Severe form outbreak

- Within 24 to 48 hours some animals will be recumbent
- Some staggering
- Others standing quietly alone
- Most affected cattle are anorexic, apathetic, and depressed
- Teeth grinding may occur in about 25% of affected sheep and goats
- Once they are ill they usually do not drink water
- Cattle may engorge themselves on water if it is readily available immediately after consuming large quantities of dry grain

Individual Animals

- Depression
 - Dehydration
 - Inactivity
 - Weakness
 - Abdominal distension
 - Diarrhea
 - Anorexia
- The temperature is usually below normal, 36.5°C to 38.5°C (98°F–101°F)
 - Animals exposed to the sun may have temperatures up to 41°C (106°F)
 - In sheep and goats, the rectal temperatures may be slightly higher than normal
 - The heart rate in cattle is usually increased and continues to increase with the severity of the acidosis and circulatory failure
 - Generally, the prognosis is better in those with heart rates below 100 beats/min than those with rates up to 120 to 140 beats/min
 - In sheep and goats, the heart rate may be higher than 100 beats/min.
 - The respirations are usually shallow and increased up to 60 to 90 beats/ min
 - A mucopurulent discharge is common because animals fail to lick their nares
 - Diarrhea is almost always present and usually profuse, and the feces are light colored with an obvious sweet–sour odor
 - The feces commonly contain an excessive quantity of kernels of grain in grain overload
 - An absence of feces is considered by some veterinarians as a grave prognostic sign
 - The dehydration is severe and progressive up to 10% to 12% BW
 - Anuria is a common finding in acute cases
 - The primary contractions of the reticulorumen are usually totally absent
 - low-pitched tinkling and gurgling sounds associated with the excessive quantity of fluid in the rumen are commonly audible on auscultation
 - The ruminal fluid is a milky green to olive brown color
 - Has a pungent acid smell

- Collection of a sample of ruminal fluid in a glass beaker will reveal an absence of foam
- The pH of the rumen fluid is usually below 5
- Severely affected animals have a staggy, drunken gait and their eyesight is impaired
- They bump into objects and their palpebral eye preservation reflex is sluggish or absent
- Acute laminitis may be present
- Affected animals are lame in all four feet
- The lameness commonly resolves if the animal recovers
- Chronic laminitis may develop several weeks later
- Recumbency usually follows after about 48
 - Affected animals lie quietly
 - heads turned into the flank
 - response to any stimulus is much decreased
- A rapid onset of recumbency suggests an unfavorable prognosis
- Mycotic Rumenitis
- Chronic laminitis
- Abortions may occur 10 days to 2 weeks



Serum Biochemistry

- The degree of hemoconcentration
- Hematocrit increases
- The hematocrit rises from a value of approximately 34% to 50% to 60% in the terminal stages
- accompanied by a fall in blood pressure
- The acute phase reactants serum amyloid A (SAA) (6 to 12 hours)
- Haptoglobin (18 to 36 hours)
- Only a mild increase in the white blood cell count
- Endotoxin (core lipopolysaccharide [LPS] from gram-negative bacteria) is rarely identified
- Blood pH, bicarbonate, and base excess fall markedly
- Plasma lactate and inorganic phosphate concentrations rise
- In almost all cases there is a mild hypocalcemia
- Serum concentrations may drop to between 6 and 8 mg/dL

Urine pH

- The urine pH falls to 4.5 to 5.0 in advanced cases of acute ruminal acidosis
- More concentrated as the animal becomes more dehydrated
- Terminally there is anuria

Low Milk-Fat Percentage

- Ruminal pH is positively correlated with milk-fat concentration for cows more than 30 days in milk
- The increased production of transoctadecenoic acids with lower rumen pH

TREATMENT

Principles of treatment

- Correct the ruminal and systemic acidosis
- Prevent further production of lactic acid
- Restore fluid and electrolyte losses
- Maintain circulating blood volumes
- Restore forestomach and intestinal motility

- Prevent further access to feed
- Monitor water intake and prevent the rapid intake of excessive quantities of water
- Offer a supply of good-quality palatable hay equal to one-half of the daily allowance per head
- Exercise all animals every hour for 12 to 24 hours

Rumenotomy

- Recumbency, severe depression, hypothermia, prominent ruminal distension with fluid, a heart rate of 110 to 130 beats/min and a rumen pH of 5 or below

Intravenous Sodium Bicarbonate and Fluid Therapy

- 5% sodium bicarbonate at the rate of 5 L for a 450-kg over a period of about 30 minutes
- Correct the systemic acidosis
- Isotonic sodium bicarbonate (1.3%) at 150 mL/ kg BW intravenously over the next 6 to 12 hours
- Urinate within 1 hour attempt to stand within 6 to 12 hours

Rumen Lavage

- Affected cattle are still standing but are depressed, their heart rate is 90 to 100 beats/min, there is moderate ruminal distension, and the rumen pH is between 5 and 6
- A large 25- to 28-mm inside-diameter rubber tube

Intraruminal Alkalinizing Agents

- In moderately affected cases, the use of 500 g of magnesium hydroxide per 450 kg BW or magnesium oxide in 10 L of warm
 - Kneading of the rumen to promote mixing
 - The oral administration of boluses of magnesium hydroxide (162 g)
 - Powdered form (450 g) dissolved in 3.5 L of water
 - Daily for 3 days
 - Both the boluses and the powder forms of magnesium hydroxide decreased rumen protozoal numbers
- Ruminal Transfaunation**
- Transfer at least 5 L of fresh rumen fluid from a healthy

Ancillary Therapy

- Antihistamines
- NSAIDs
- Thiamin or brewer's yeast to promote the metabolism
- Parasympathomimetics
- Calcium borogluconate
- Orally administered antimicrobials

CONTROL AND PREVENTION

- A gradual period of adaptation
 - Begin with small amounts of concentrate 8 to 10 g/kg BW
 - Increased every 2 to 4 days by increments of 10% to 12%
- Dietary Buffers**
- Sodium bicarbonate
 - A level of 2% dietary sodium bicarbonate, sodium bentonite, or limestone provided
 - 10% alfalfa hay

Ionophores

- Salinomycin, monensin, and lasalocid
- Salinomycin is more effective than the other two
- Increase milk production, modify milk composition, and improve health

Probiotics

- *Megasphaera elsdenii*
 - *Butyrivibrio fibrisolvens*
 - *Selenomonas ruminantium*
- Yeast (*Saccharomyces cerevisiae*, dried or live-active dry-) and fungi (*Aspergillus oryzae*) have been proposed as alternative to bacterial microbials

Immunization

- Vaccination against *Streptococcus bovis* and *Lactobacillus* spp
- Immunization induced high levels of persistent saliva antibody responses against *S. bovis* and *Lactobacillus*
- Preparations of polyclonal antibodies against *S. bovis* or *Fusobacterium necrophorum*

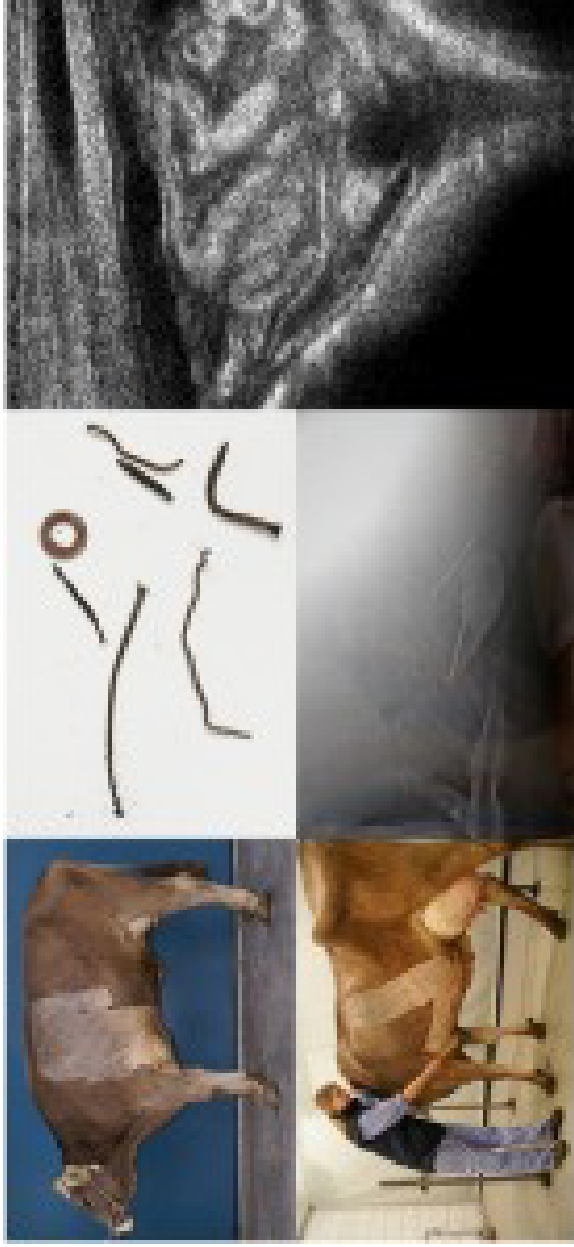




VMD-411: Theory Class

Traumatic Reticuloperitonitis

Hardware Disease



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TRP

- Ingestion of sharp objects such
- Nails or pieces of wire
- Penetrate or perforate the wall of the reticulum
- Pica
- Lower blood concentrations of zinc, copper and calcium

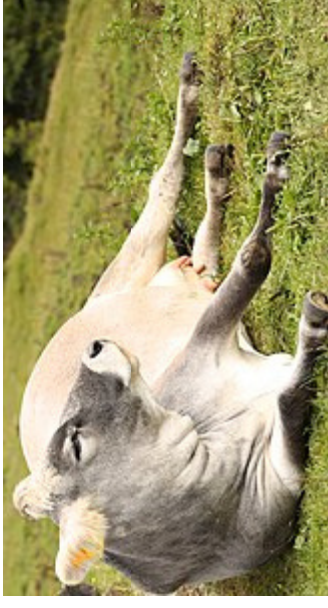


Clinical findings

- Abnormal general demeanour
- Reduced or absent rumen motility
- A minimum of one positive foreign body test
- Poorly digested faeces
- Decreased or absent intestinal motility
- Reduced rumen fill
- Fever
- Spontaneous signs of pain
 - Arching of the back
 - Bruxism
 - Grunting
- Watery to loose faeces
- Fuller than normal rumen



- Abnormally thick faeces
- Ruminant tympany
- Distension of the rumen
- Eating and rumination decreased
- The sternum is involved in the inflammatory process
- Affected cattle rest in lateral recumbency to avoid pressure on the painful sternal region



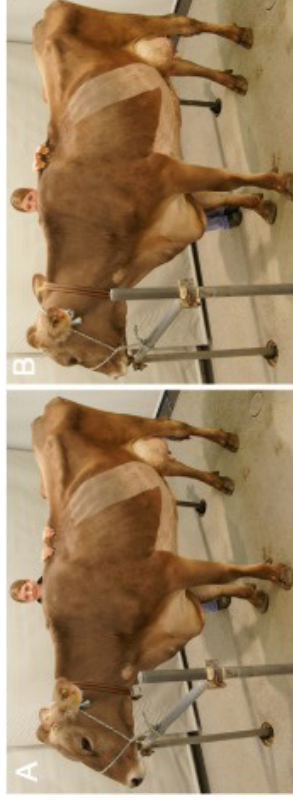
Complications of TRP

- Traumatic pericarditis
- Hepatic inflammation or abscesses
- Splenic inflammation or abscesses
- Pleuropneumonia
- Vagal indigestion
- Generalized peritonitis
- Cardiac tamponade
- Fatal reticular haemorrhage after puncture of the reticular vein
- Thrombosis of the cranial vena cava
- Aortic thromboembolism
- Diaphragmatic hernia



Clinical diagnosis

- A goal of the clinical diagnostic procedure is to elicit a grunt or groan
- Foreign body tests
- Eliciting a grunt is easier in acute than in chronic TRP
- The audibility of a grunt can be enhanced by placing a stethoscope over the larynx or trachea
- Vibrations associated with the grunt may be felt by placing the palm of one hand over the laryngeal area
 - The back grip
 - The pain percussion over of the reticulum with a hammer
 - The pole

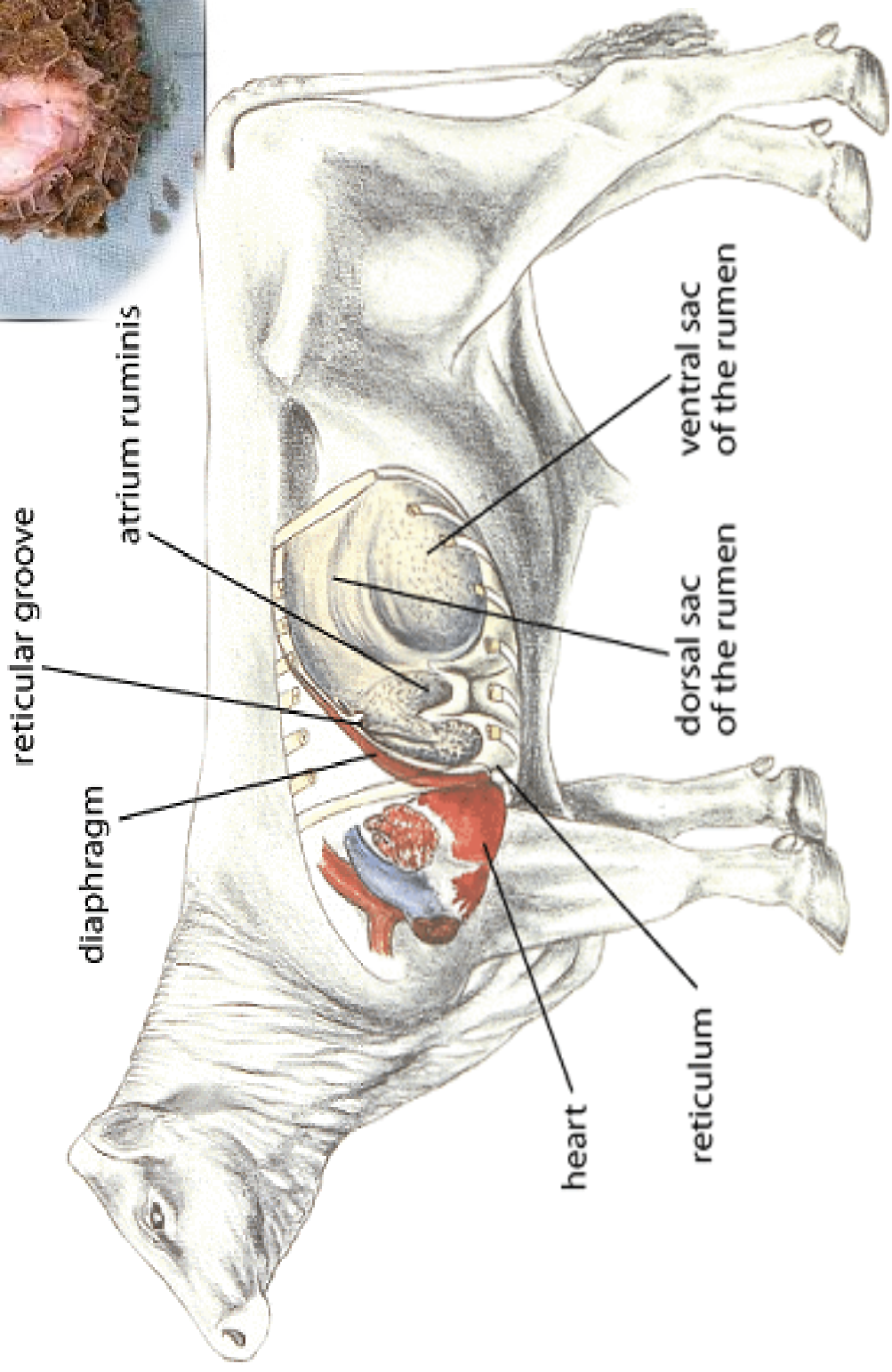


Other tests

- Down Hill Test
- Ferroscopy



Pathogenesis



Acute Local Peritonitis

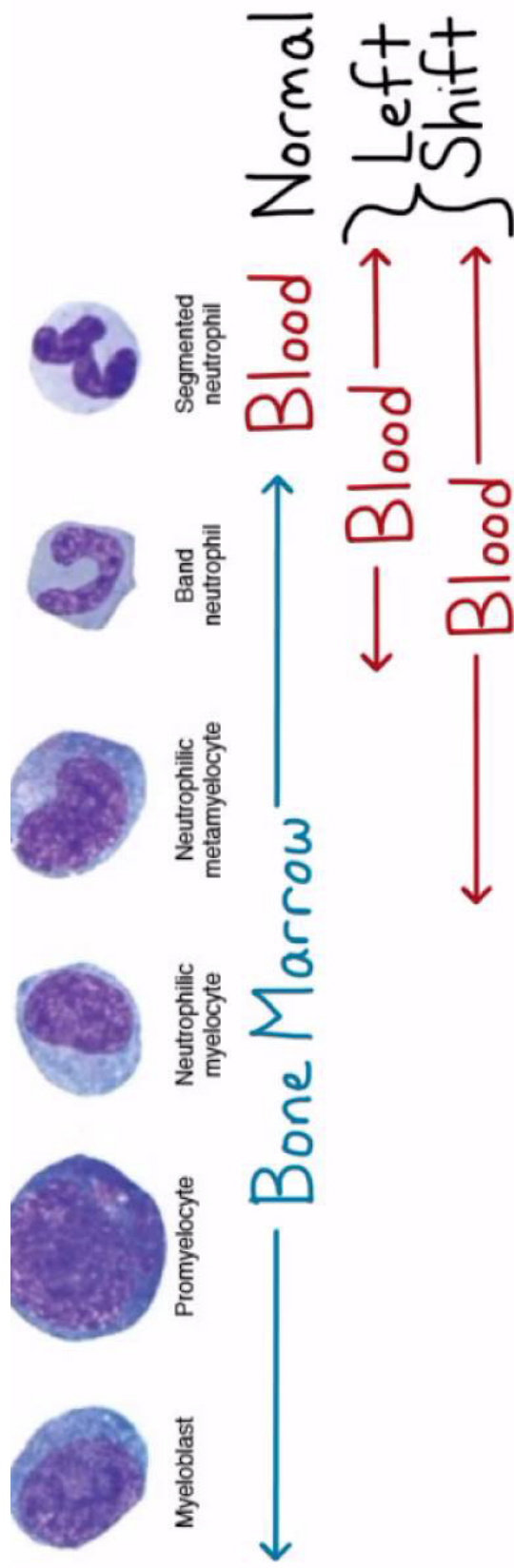
- Onset is sudden with complete anorexia and a marked drop in milk yield
- Changes occur within a 12-hour period and their abrupt appearance is typical
- Subacute abdominal pain is common
- Reluctant to move and does so slowly
- Most animals prefer to remain standing for long periods and lie down with great care
- Arching of the back along with the appearance of tenseness of the back and the abdominal muscles
- The animal appears gaunt or “tucked-up”
- Defecation and urination cause pain
- Constipation, scant feces, and in some cases retention of urine
- Rarely, acute abdominal pain with kicking at the belly and stretching
- A moderate systemic reaction is common
- Temperature ranges from 39.5°C to 40°C (103°F–104°F)
- Heart rate is about 80 beats/min
- Respiratory rate about 30 per min
- Temperatures above 40°C (104°F) accompanied by heart rates greater than 90 beats/min suggest severe complications
- Rumination is absent and reticulorumen movements are markedly depressed and usually

Acute Diffuse (Generalized) Peritonitis

- Profound toxemia within a day or two of the onset of local peritonitis
- Alimentary tract motility is reduced
- Mental depression is marked
- Temperature is elevated or subnormal in severe cases
- Heart rate increases to 100 to 120 beats/min
- Painful grunt may be elicited by deep digital palpation
- Terminally, recumbency and depression are common

Clinical Pathology

- Total and differential leukocyte counts
- The differential leukocyte count is more indicative of acute peritonitis
- In acute local peritonitis a neutrophilia and a **regenerative left shift**
 - Mature neutrophils above 4000 cells/ μ L
 - Immature neutrophils above 200 cells/ μ L
- In acute diffuse peritonitis a leukopenia
- Total count below 4000 cells/ μ L
 - Greater absolute number of immature neutrophils than mature neutrophils
 - **Degenerative left shift**
 - Unfavorable prognosis if severe



① Degenerative ② Regenerative

&|or { *Immature > Seg. Neuts.
 *↓ Seg. Neuts. + Left shift

- Severe/Overwhelming inf.
- Sepsis, severe infection
- P,

- Hyperfibrinogenaemia and hyperproteinaemia
- The **glutaraldehyde coagulation test** is a simple and rapid
- Positive correlation between the time to gel formation and the g-globulin and fibrinogen concentrations
- Other acute-phase proteins including serum amyloid A and haptoglobin

GT Category	Coagulation time TG	Interpretation	Inflammatory process
1	0 – ≤ 3 minutes	High increase in concentration of fibrinogen and / or immunoglobulin	Severe
2	>3 – ≤ 6 minutes	Moderate increase in concentration of fibrinogen and/or immunoglobulin	Moderate
3	>6 – ≤ 15 minutes	Low increase in concentration of fibrinogen and/or immunoglobulin	Mild
4	> 15 minutes	No increase in concentration of fibrinogen and/or immunoglobulin	Not detectable

Abdominocentesis and Peritoneal Fluid

- A nucleated cell count above 6000 cells/ μL and total protein above 3 g/dL
- Diagnosis of peritonitis in 80% of cases
- A relative neutrophil count more than 40% and a relative eosinophil count less than 10%
- A D-dimer concentration of peritoneal fluid higher than the reference range (0–0.6 mg/L)

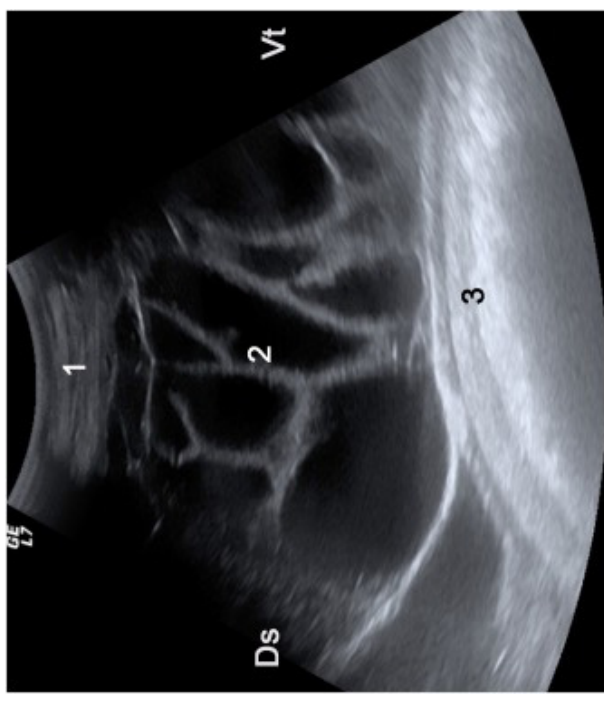
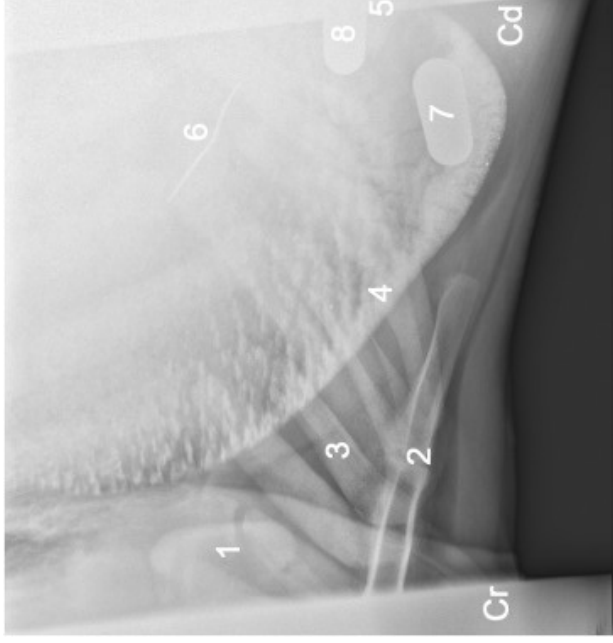


Radiography of cranial abdomen and reticulum

- An x-ray machine with a capacity of 1000 to 1250 mA and 150 kV is necessary

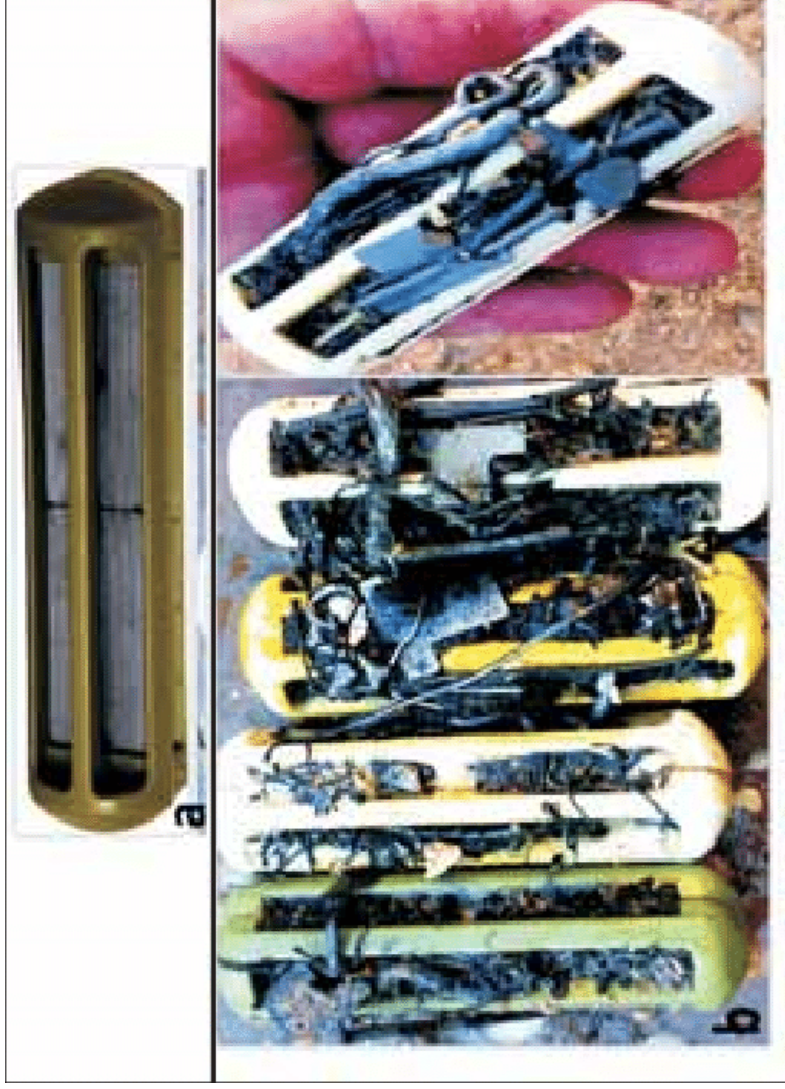
Ultrasonography of the reticulum

- 3.5-MHz linear transducer



Oral administration of the strongest

Magnet



Feed chopping equipment have magnets attached





VMD-411: Theory Class

Traumatic Pericarditis



Dr. Shanker Kr. Singh

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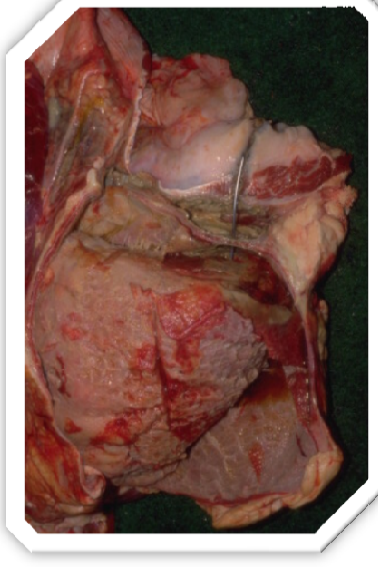
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Pericarditis

- Inflammation of the pericardium
- Accumulation of serous or fibrinous inflammatory products
- Associated with progressive disturbances in heart function
- The development of toxemia and congestive heart failure
- Almost always results in death
- Long, thin sharp foreign bodies
- Penetrate the reticulum, diaphragm and pericardial sac



- Haematogenous spread of infectious diseases
 - Colibacillosis
 - Pasteurellosis
 - Salmonellosis
 - Anaerobic infections
- Usually masked by signs of septicaemia
- Idiopathic pericarditis
 - Humans
 - dogs
 - Horses
- Rare in cattle

PATHOGENESIS

- Penetration of the pericardial sac
- During late pregnancy or at parturition
- Introduction of a mixed bacterial infection from the reticulum
- Persistence of the foreign body in the tissues is not essential
- The first effect of the inflammation is hyperemia of the pericardial surfaces

Two mechanisms then operate to produce signs

- The toxemia : Depression
- The pressure on the heart : Edema
- Produces congestive heart failure
- Affected animal may be severely ill for several weeks
- Edema developing only gradually
- Extreme edema may develop within 2 to 3 days



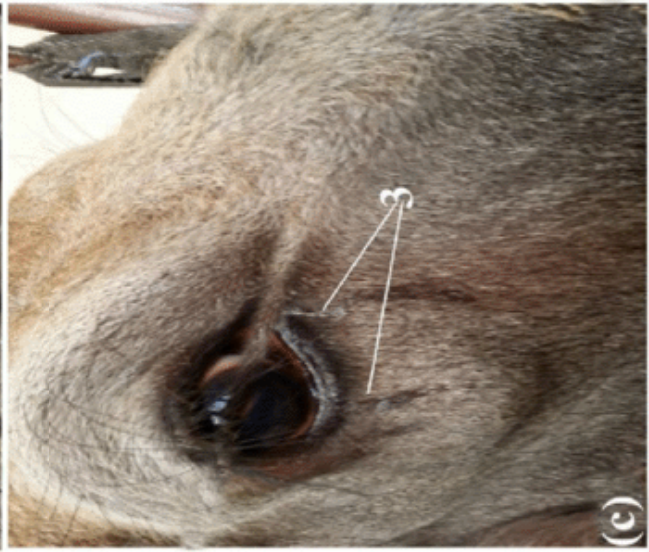
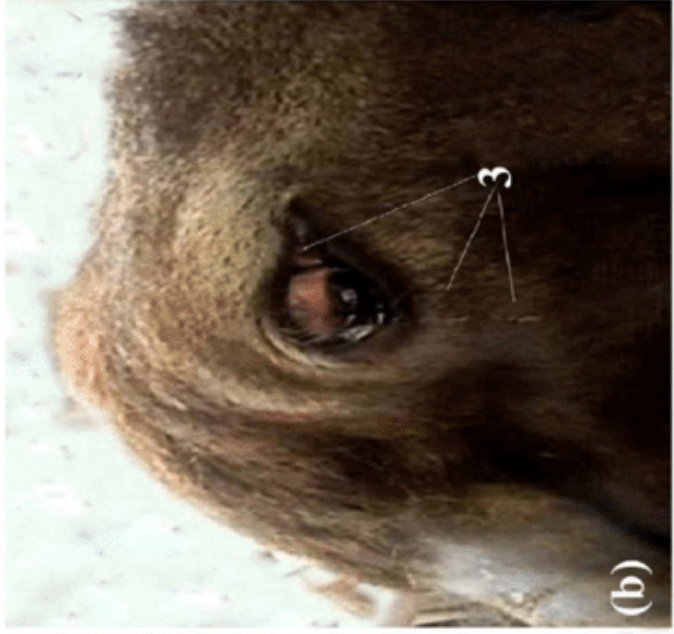
Clinical findings

- Depression
- Anorexia
- Habitual recumbency
- Rapid weight loss
- Diarrhea or scant feces may be present
- Grinding of the teeth, salivation, and nasal discharge are occasional
- Stands with the back arched and the elbows abducted



- Respiratory movements are more obvious
- Mainly abdominal and shallow
- Rate to 40 to 50 /min
- Often accompanied by grunting
- Bilateral distension of the jugular veins
- Edema of the brisket and ventral abdominal
- A prominent jugular venous pulse is usually visible and extends proximally up the neck
- Edema of the conjunctiva with grapelike masses of edematous conjunctiva hanging over the eyelids

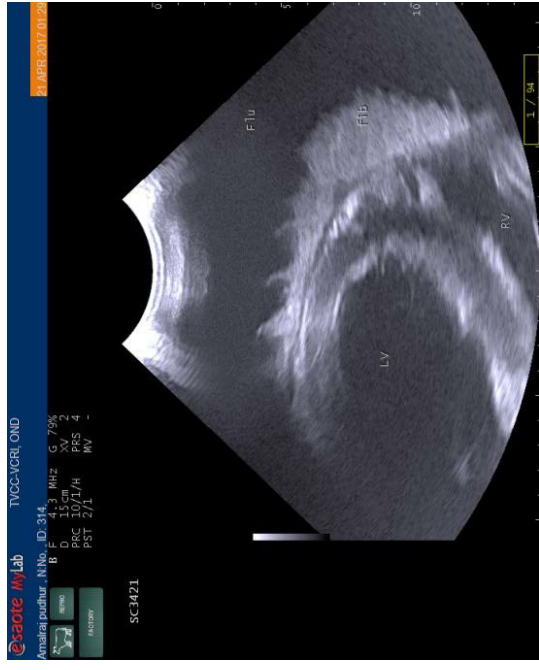




- Pyrexia (40°C–41°C, 104°F–106°F) is common in the early stages
- Increase in the heart rate to 100 beats/min
- Diminution in the pulse amplitude
- Rumen movements are usually present but depressed
- Pinching of the withers or pole test elicits a marked painful grunt
- Auscultation of the thorax reveals the diagnostic findings
- Early stages the heart sounds are normal but are accompanied by a pericardial friction rub
- May wax and wane with respiratory movements
- Muffled and there may be gurgling, splashing, or tinkling sounds
- Careful auscultation of the entire **precordium** on both sides of the thorax is essential



- Lateral radiographs of the ventral thorax and cranial abdomen with the animal standing are very helpful
- Ultrasonography is the preferred method for documenting the presence of pericardial effusion and facilitating pericardiocentesis



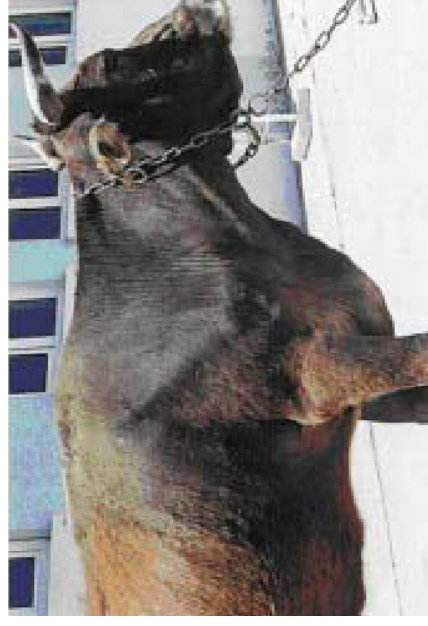
Terminal stages

- Gross edema
- Dyspnea
- Severe watery diarrhea
- Depression
- Recumbency
- Complete anorexia
- Enlargement of the liver may be detectable
- Palpation behind the upper part of the right costal arch in the cranial part of the right paralumbar fossa
- Death is usually caused by asphyxia and toxemia



Animals that have recovered from an initial pericarditis

- Usually affected by the chronic form
- Body condition is poor
- Appetite is variable
- No systemic reaction
- Demeanor is bright
- Edema of the brisket is usually not prominent
- But there is jugular engorgement
- Heart sounds are muffled and fluid splashing sounds
- Heart rate is rapid (90–100 beats/ min)



CLINICAL PATHOLOGY

- A pronounced leukocytosis with a total count of 16,000 to 30,000 cells/ μL
- A neutrophilia and eosinopenia is usual
- Hyperfibrinogenemia
- Marked increases in serum total protein concentration
- Shortened time for the glutaraldehyde clotting test

Pericardiocentesis

- Pericardial fluid may be sampled by centesis with a 10-12 cm 18-gauge needle
- Over the site of maximum audibility of the heart sound
- Fourth or fifth intercostal space on the left side

In midstage pericarditis

- Fluid is usually easily obtained and is foul smelling and turbid

In chronic pericarditis

- Small amounts may be present and a sample may not be obtainable

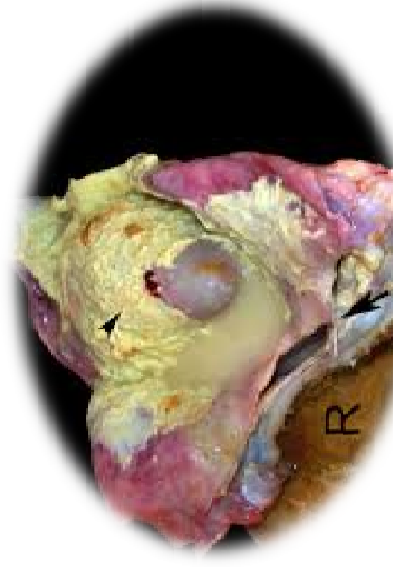
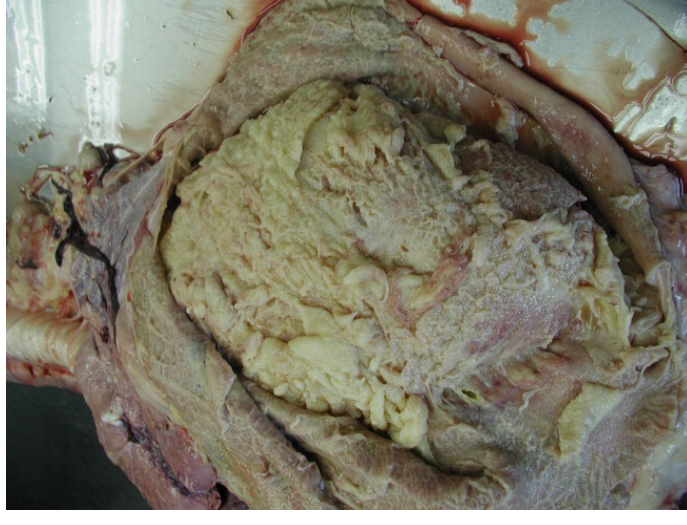
NECROPSY FINDINGS

In acute cases

- Gross distension of the pericardial sac
- Foul-smelling, grayish fluid containing flakes of fibrin
- Serous surface of the sac is covered by heavy deposits of newly formed fibrin

In chronic cases

- Pericardial sac is grossly thickened
- Fused to the pericardium by strong fibrous adhesions surrounding loculi of varying size
- Contain pus or thin straw-colored fluid



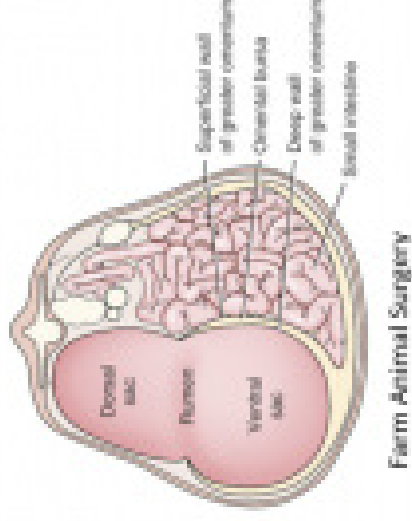
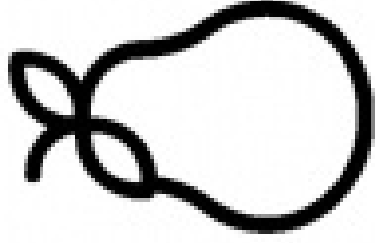
Treatment

- Usually unsatisfactory
- Placement of a pericardial catheter
- Daily pericardial lavage with dilute iodine solutions in 0.9% NaCl
- Long-term systemic treatment with antimicrobial
- Onetime drainage of the pericardial sac
- May temporarily relieve the edema and respiratory embarrassment
- Pericardiectomy using a fifth rib resection



VMD-411: Theory Class

Vagal Indigestion Syndrome in Ruminants



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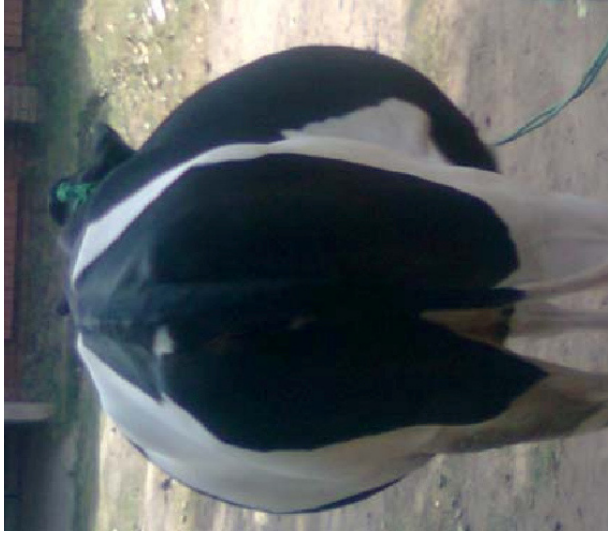
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Chronic indigestion/ Hoflund

Syndrome

- Gradual development of abdominal
- Secondary to rumenoreticular distention
 - Injury
 - Inflammation
 - Pressure on the vagus nerve
- Vagal nerve damage is not present in most cases
- Traumatic reticuloperitonitis is the most common
- Mechanical obstruction of the cardia or reticulo-omasal orifice
- Papillomas or ingested placenta



- Four types of vagal indigestion described
- Site of the functional obstruction

Type I

- Failure of eructation or free-gas bloat

Type II

- Failure of omasal transport

Type III

- Secondary abomasal impaction

Type IV

- Indigestion of late gestation

Type I Vagal indigestion

- Failure of eructation
- Free-gas bloat
- Inflammatory lesions in the vicinity of the vagus nerve
- localized peritonitis
- Adhesions
- Chronic pneumonia with anterior mediastinitis
- Pharyngeal or esophageal compression by abscesses or neoplasia

Type II Vagal Indigestion

- Failure of omasal transport
- Any condition that prevents ingesta from passing through the omasal canal into the abomasum
- Adhesions and abscesses (reticular or single liver abscesses) are the most common
- The result of traumatic reticuloperitonitis

Mechanical obstruction of the omasal canal by ingested material

- Plastic bags
- Rope
- Placenta

Masses

- Lymphosarcoma
 - Squamous Cell Carcinoma
 - Granulomas
 - Papillomas



Type III Vagal indigestion

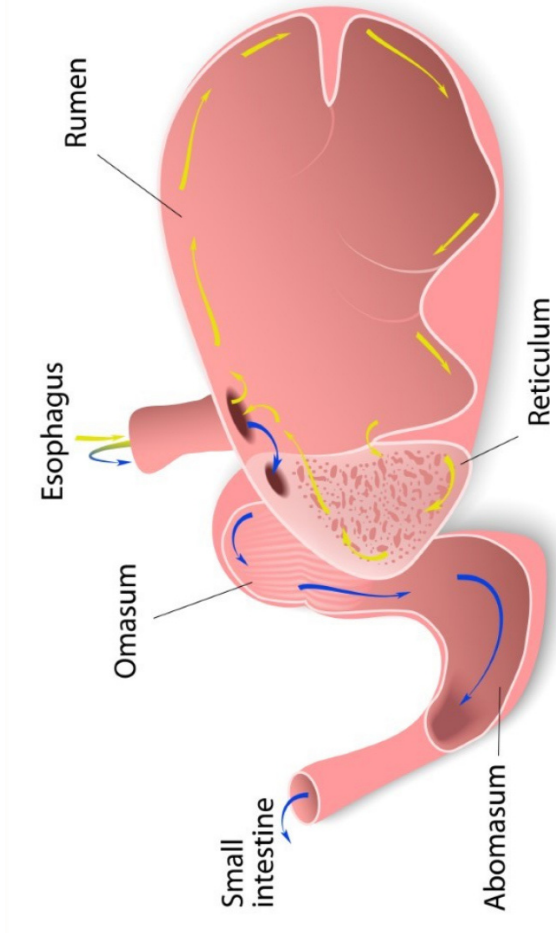
- A secondary abomasal impaction
- Mechanical fixation of the reticulum
reticuloperitonitis interferes with the normal sieving
- Passage of large fiber particles (>2 mm long) into the abomasum
- The abomasum has difficulty in emptying the larger particles of food
- Accumulate in the abomasum
- Resulting in abomasal impaction

Type IV vagal indigestion

- Partial forestomach obstruction
- During gestation
- Termed indigestion of late gestation
- Enlarging uterus shifting the abomasum to a more cranial position
- Inhibits normal abomasal emptying

Pathogenesis

- Disturbances in the passage of ingesta through the reticulomasal orifice
 - Failure of omasal transport and anterior functional stenosis
- Disturbances in the passage of ingesta through the pylorus
 - Pyloric stenosis and posterior functional stenosis
- Achalasia of the sphincters may occur
- Distension of the rumen with pasty or frothy contents
- Increased time and maceration in the reticulorumen
- Alterations in reticulorumen motility
- An increase in undigested particles in the feces
- Scant feces
- Acid-base imbalance
- Secondary starvation
- It is an outflow abnormality of the reticulorumen and abomasum



3 Phase

In the first phase

- Reticulorumen motility is decreased
- impairs clearance function of the reticulum
- Resulting in poorly comminuted feces

The second phase

- Adhesions are extensive enough to cause additional impairment of reticular motility
- Particle distribution within the reticulorumen is changed
- Loss of stratification
- The volume of the reticulorumen increases because rumen outflow is decreased
- The rumen may become hypermotile

The third phase

- A further change in the consistency of rumen contents
- a homogeneous pasty mass of relatively high viscosity
- The increase in dry matter content of the rumen outflow material inhibits transpyloric digesta flow
- The abomasum enlarges
- Reflux of abomasal contents may occur



Anterior Functional Stenosis (Achalasia)

- This is characterized by accumulation of ingesta in the reticulorume
- failure of omasal transport
- If the ruminal wall is atonic, the ingesta accumulates without bloat occurring
- If it has normal motility, the ruminal wall responds to the distension by increased motility and the production of frothy bloat
- Ruminal motility will be almost continuous (3–6 contractions per minute)
- The rumen enlarges to fill the majority of the abdomen
- Gross distension of the abdomen
- The dorsal sac of the rumen enlarges to the right of the midline
- The ventral sac enlarges to fill most or all of the right lower quadrant of the abdomen
- This results in the “L-shaped” rumen as viewed from the rear of the animal
- Bradycardia is common and has been attributed to increased vagal tone

Posterior Functional Stenosis (Achalasia)

- Failure of transpyloric outflow
- Abomasal impaction with large particles
- Abomasal fluid containing hydrochloric acid may reflux into the rumen
- Abomasal reflux syndrome
- The chloride concentrations in the rumen fluid increase
- There is a hypochloremia and hypokalemia
- Metabolic hypochloremic, hypokalemic alkalosis
- Dehydration

Clinical findings

- Inappetence for several days
- Complete anorexia with evidence of loss of BW
- An enlarged papple-shaped abdomen
- Dehydration and electrolyte imbalance with metabolic alkalosis
- Enlarged rumen palpable on rectal examination
- Scant feces with an increase in undigested particles
- Enlarged ingesta-impacted or fluiddistended abomasum palpable through right flank or on rectal examination
- Rumen motility is often increased (**abdominal ripples**)
- Bradycardia
- Vital signs within the normal range
- Inadequate response to treatment

- Left dorsal
- Left and right ventral
- **Papple shape**

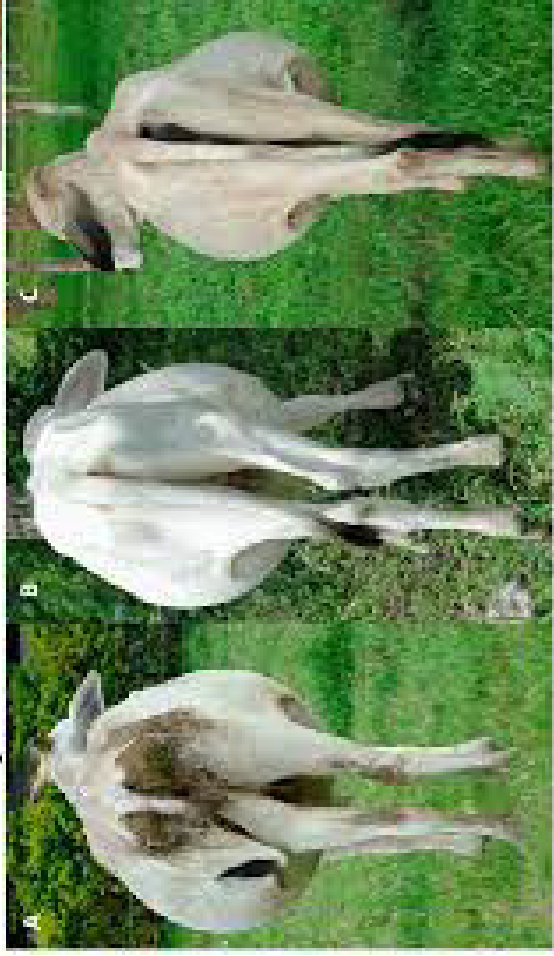
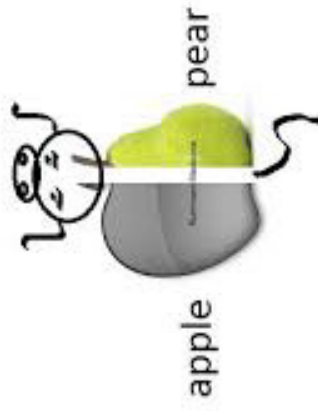


FIGURE 4. Visual indicators. Dorsal distinction of the abdomen with left ventral and dorsal dimensions and right dorsal dimensions (apple pear). A: cow 01; B: cow 02; and C: cow 03. *Downloaded from <http://ajphaphysiol.physiology.org/> at 01:00 AM on 02 July 2015.*

TREATMENT

- Rumen Lavage
- Large-diameter (25-mm inside diameter) stomach tube



Fluid and Electrolyte Therapy and Laxatives

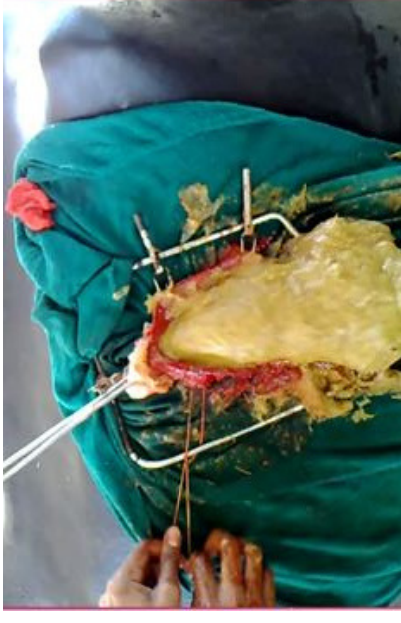
- Some cases respond beneficially following fluid and balanced electrolyte therapy for 3 days
- Oral administration of mineral oil (5–10 L) daily for 3 days
- Dioctyl sodium sulfosuccinate
- 120 to 180 mL of a 25% solution for a 450-kg animal daily for 3 to 5 days
- It is mixed with 10 L of warm water and 5 L of mineral oil
- Rumenotomy

DIAPHRAGMATIC HERNIA

- Herniation of a portion of the reticulum through a diaphragmatic rupture
- Causes chronic ruminal tympany, anorexia, and displacement of the heart
- Weakening of the diaphragm by lesions of traumatic reticuloperitonitis
- An unusually high incidence of herniation of the reticulum through the diaphragm in water buffalo

PATHOGENESIS

- The usual syndrome is similar to that of vagus
- It seems probable that there is either achalasia of the reticulomasal sphincter caused by involvement of the vagus nerve
- Impairment of function of the esophageal groove caused by the fixation of the reticulum to the ventral diaphragm
- The disturbance of function in the forestomachs suggests that food can get into the rumen but cannot pass from there to the abomasus
- Hypermotility is thought to be caused by overdistension of the rumen and to be the cause of frothy bloat
- Usually no interference with respiration without major herniation, but displacement and compression of the heart is common



CLINICAL FINDINGS

- There is a capricious appetite and loss of condition for several weeks before abdominal distension
- Persistent moderate tympany of the rumen
- Grinding of the teeth may occur
- Feces are pasty and reduced in volume
- Rumination does not occur but occasionally animals regurgitate when a stomach tube is passed
- The temperature is normal
- Bradycardia may be present (40–60 beats/min)
- Breathing is usually normal
- Reticular sounds are audible just posterior to the cardiac area in many normal cows
- They are not significantly increased in diaphragmatic hernia
- A more severe syndrome is recorded in cases in which viscera other than a portion of the reticulum is herniated
- Affected animals usually die of inanition in 3 to 4 weeks after the onset

Treatment

- Most recorded attempts at surgical repair in cattle have been unsuccessful
- Treatment is not usually recommended