

PATHOLOGY OF ALIMENTARY SYSTEM

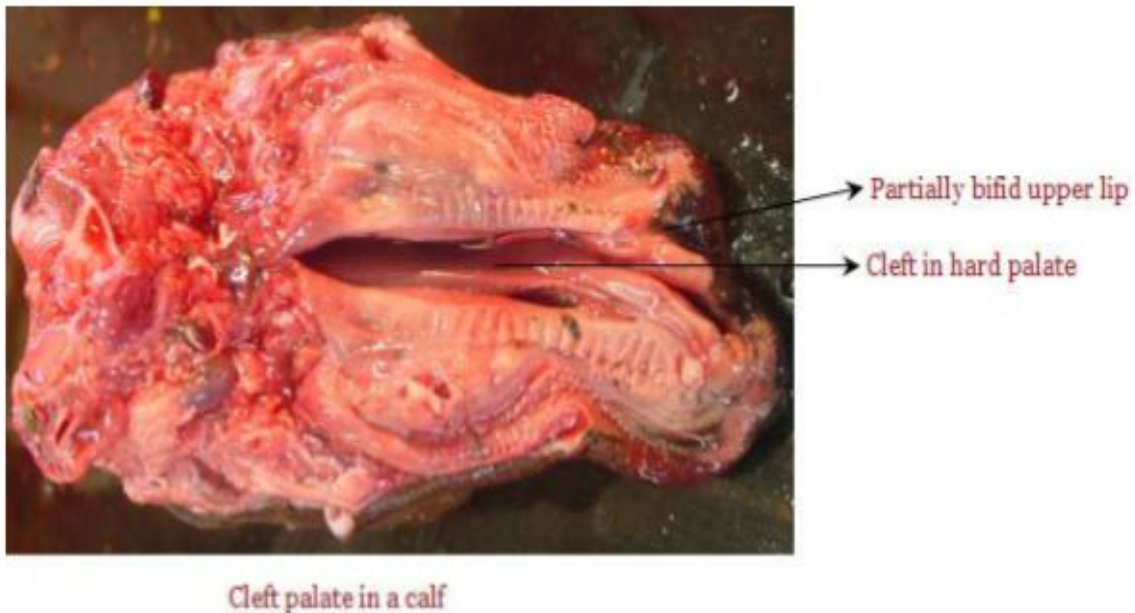
Learning objectives

In this lecture the viewer will be able to know the pathological conditions affecting the mouth, pharynx, salivary glands, oesophagus and crop.

MALFORMATIONS

Cleft lip (Chelioschisis) and cleft palate (Palatoschisis)

- Clefts of the mouth are midline fusion defects which occur during embryonic development.
- In cleft palate, the ingesta is likely to enter the respiratory passages and cause aspiration pneumonia and death.



CARIES

Definition: Caries means decay of teeth in which the enamel is decalcified followed by softening and discoloration.

Occurrence: Caries is rare in domestic animals. o This occurs occasionally in pet dogs with imbalanced and inadequate diets.

Etiology: Disturbances in calcium and phosphorus metabolism as well as dietary deficiencies of these minerals. It is frequently seen in fluorine poisoning.

Pathogenesis: The organic acids especially lactic acid, that are formed due to the action of bacteria on carbohydrates dissolve the salts of the enamel. Then, the same acids corrode into the

less strong dentine, which contains in its structure 30% of protein. o The damage to the dentine is deeper and most widespread. The opposed surfaces of adjacent teeth may be more frequently affected.

Clinical signs: The affected teeth which are shaky and painful interfere with mastication.

Gross pathology: The affected teeth usually have one or more depressed areas, which are brown or black in colour. In the early incipient stages, “Enamel Flecks” which are yellow stained spots on the enamel can be seen.

STOMATITIS

Definition

This is diffuse inflammation of the mucous membrane of the mouth. But when confined to particular parts of the mouth, it is known as:

- ✓ Gingivitis for inflammation of the gums.
- ✓ Glossitis for inflammation of the tongue.
- ✓ Lampas for inflammation of the palate.
- ✓ Cheilitis for inflammation of the lips.
- ✓ Pharyngitis for inflammation of the pharynx and
- ✓ Tonsillitis for inflammation of the tonsils.

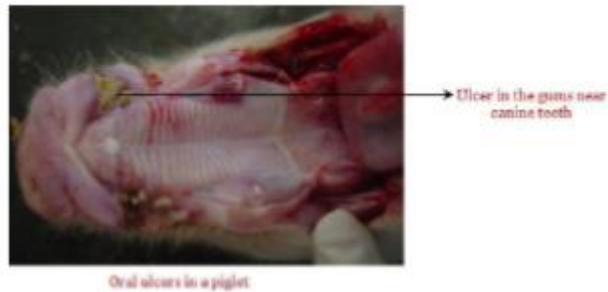
Aetiology: It may be a primary affection or may occur as secondary to other diseases viz. gastritis or infectious diseases.

The possible causes are:

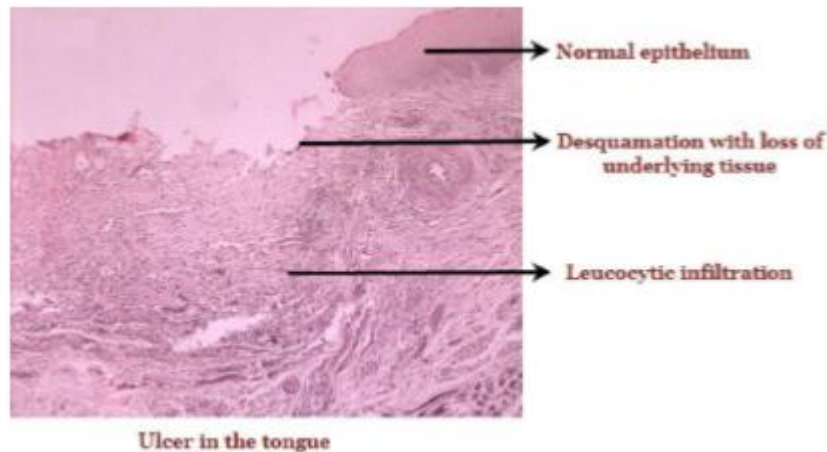
- ✓ Physical: Trauma by awns, thorns, burrs, wood pieces, glass pieces, sharp bits, irregular sharp teeth, sharp edged feeding utensils.
- ✓ Thermal injuries: Hot drenches and eating frozen foods.
- ✓ Chemical : caustic alkalies, corrosive acids, fertilizers.
- ✓ Deficiency of vitamins: Hypovitaminosis A especially in fowl
- ✓ Niacin deficiency : Black tongue in dogs
- ✓ Microorganisms: Bacteria: Actinomyces bovis; Actinobacillus lignieresii; Corynebacterium pyogenes; Streptococci and Staphylococci.
- ✓ Fungi: Candida albicans and Oidium pullorum in poultry.
- ✓ Viruses: Foot and Mouth disease; Rinderpest; Virus diarrhoea -mucosal disease.

Gross pathology

- The lesion starts as catarrhal inflammation of the mouth and pharynx with reddening and swelling of the mucosa which is covered by small, whitish raised spots (Aphthous stomatitis).
- These spots may latter develop into small crusts or into ulcers.



Histopathology: Microscopically, in case of ulcer of tongue, the surface epithelium of the tongue is lost and the underlying area is infiltrated with leucocytes.



TYPES OF STOMATITIS

- ✚ Vesicular stomatitis
- ✚ Catarrhal and vesicular stomatitis may develop into ulcerative variety.
- ✚ Fibrinous and necrotic stomatitis
- ✚ Gangrenous stomatitis
- ✚ Thrush is found in birds.

Sequelae: Starvation as prehension and mastication are prevented. Spread of infection to other parts- oesophagus, lungs, stomach etc.

TUMOURS OF THE MOUTH AND PHARYNX

- ❖ Tumors of the mouth and pharynx are common.
- ❖ Most common neoplasms in the dog and calves are the infectious papillomas, occurring as clusters on the lips and gums.
- ❖ These are caused by papilloma virus.
- ❖ Epulis is a fibroblastic tumour consisting of dense fibrous tissue with varying amounts of epithelium and a few giant cells. They usually occur in the gums: Carcinoma, sarcoma, fibroma and melanoma are other tumors occasionally seen.

OESOPHAGEAL CHOKE

Definition: Choke is obstruction of the esophagus.

Occurrence: It occurs in horses and cattle, but more common in the former.

Aetiology:

- ✓ Old age
- ✓ In cattle, large objects of food- beet root, carrot, apples, potatoes, fetal membranes, sticks and wire. In dogs, large bones.
- ✓ Impacted masses of feed due to improper chewing, bad teeth and rapid gulping of dry feed.
- ✓ Lesions of esophagus – stenosis or diverticulum cause repeated choking.
- ✓ Enlarged lymph nodes- mediastinal and cervical.
- ✓ Enlarged thyroids.
- ✓ Neoplasms of adjacent tissue especially thymus - thymoma in new-born animals.

Gross pathology

- In the horses choke occurs in the thoracic area while in cattle and dogs the pharynx is obstructed.
- Choke may be complete or incomplete.

Complete choke: In complete choke, feed will be returned and water will flow through the nostrils when animal is watered.

- Aspiration of the feed will cause secondary foreign-body pneumonia.
- In cattle, complete obstruction will cause dangerous tympany.
- Because of pressure, ischemia and resultant necrosis and gangrene may develop.
- Infection may spread to the surrounding tissues- cellulitis or to the lungs- gangrenous pneumonia.
- Resultant sapremia or toxemia is the cause of death in fatal case.

Partial choke: Partial obstruction will give rise to dilatation of esophagus above the obstruction the esophageal diverticulum.

Sequelae: Death due to gangrenous pneumonia, bloat, cellulitis or asphyxiation. Esophageal diverticulum, Rupture of esophagus.

DILATATION (ECTASIA)

Types: The dilatation of esophagus may be fusiform or cylindrical.

Occurrence: Fusiform dilatation of the esophagus is more common.

Aetiology:

- Accumulation of food proximal to a stenosed area.
- In ruminants accumulation of food during regurgitation on the distal side of stenosed area.
- Trauma from horns etc., rupturing the muscular coat.

- Relaxation of the esophageal muscles consequent to the nervous lesions.

Sequelae:

- ✓ The food gets accumulated in the dilated area of esophagus leading to pressure and rupture.
- ✓ The food may become decomposed and produce softening of the epithelium, inflammation, ulceration, gangrene and death.
- ✓ In ruminants, bloat occurs.

OESOPHAGITIS

Definition: This is inflammation of the oesophageal mucosa.

Occurrence: It is rare in animals because of the thick and resistant condition of the mucosa.

Aetiology:

- Trauma by probing, stomach tube or foreign bodies.
- Chemicals – corrosives.
- In the fowl, thallium sulphate poisoning.
- Avitaminosis A in Fowls.
- Viral enteritis and mucosal disease in cattle.
- Parasites – bot fly larvae in horses and hypoderma larvae in cattle.
- Persistent vomiting in dogs and pigs.

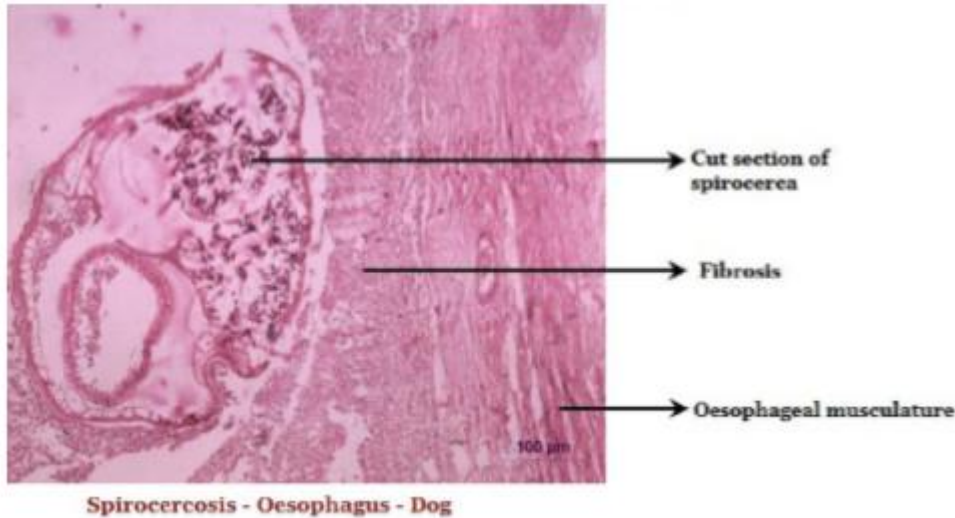
Gross pathology:

- The mucosa is red and swollen.
- In the catarrhal variety, the exudate is mucous.
- The ulcerative variety is met with in conditions caused by trauma (Stomach tube) and in viral enteritis and mucosal disease in cattle.

Sequelae: Usually recovery occurs. Stenosis may result in severe cases. When pyogenic bacteria enter the place of obstruction (in choke) which had become necrotic due to pressure, suppurative oesophagitis occurs.

NEOPLASMS OF THE OESOPHAGUS

Neoplasms of the oesophagus are not common. The connective tissue tumours of the dog have been reported. In the thoracic portion of the oesophagus, fibrosarcomas and osteogenic sarcomas are found in connection with *Spirocerca lupi* infection.



- The osteogenic sarcoma is evidently a metaplastic manifestation of the fibrosarcoma.
- Metastases of these tumors are sometimes found in the lungs and other tissues.
- Carcinoma in cat and horse and papilloma in cattle are other tumours met with.

OBSTRUCTION OF CROP IN BIRDS

Aetiology:

- Ingestion of large quantities of dry grain which swell in the crop and form a hard mass
- Atony or paralysis of wall leading to stasis of food.
- Foreign bodies like wire etc.

Gross pathology:

- The stagnated food gets decomposed, gas accumulates and inflammation sets in.

Sequelae:

- ✓ Rupture due to distention by food and gas or due to penetration by the foreign body.
- ✓ Death because of heart failure due to pressure on heart.
- ✓ Asphyxia due to compression of trachea.
- ✓ Intoxication due to absorption of toxins from decomposed foods.
- ✓ Starvation, since, food does not enter the proventriculus

INGLUVITIS

Definition: Inflammation of crop is called ingluvitis. Acute catarrhal ingluvitis.

Aetiology:

- ✓ Trauma by foreign bodies.
- ✓ Chemical agents : phosphorus, fertilizers

- ✓ Toxins from decomposed food.
- ✓ Infectious diseases.
- ✓ Parasites – *Acuaria* sp ; *Capillaria* sp

Gross pathology: Lesions include cogestion, edema and tympanites. Diphtheritic ingluvitis.
This is found in fowl pox.

TYMPANITES OR BLOAT

Physiological considerations:

Normally animals get rid of gases produced in the rumen by eructation. Saliva which has important antifoaming properties plays a significant part in the prevention of bloat. Mucin in saliva prevents formation of froth.

Aetiology:

- ✓ Bloat (or accumulation of gas) can occur.
- ✓ When the gas is produced at too rapid a rate than can be eructated.
- ✓ When the eructation mechanism is faulty.

Types:

- Based on course, bloat may be acute or chronic.
- Based on nature of gas, bloat may be dry or frothy

Acute bloat:

- This may be due to complete choke in esophagus.
- It may also be due to sudden changes of feed.
- Excessive feeding on legumes that are wet with dew or rain.

Chronic bloat:

- ✓ The chronic variety occurs whenever there is any hindrance to eructation in the esophagus either within or without pressure by tumors, foreign bodies, enlarged lymph nodes, abscesses, constrictions or diverticula.
- ✓ It may occur in lesions of the rumen causing decreased contractions of the ruminal wall as in atony, serosal adhesions, paresis, diffuse lymphomatosis.

Dry bloat

- The dry bloat is less harmful, since in this condition, the gases can be more easily got rid of by eructation.

Frothy bloat

- In the frothy bloat, the gas is trapped as small bubbles in the fluid forming a foamy mass which is not easily eructated.

Aetiology: The following are supposed to produce frothy bloat

- Saponin found in plants is a good saponifying agent.
- Water-soluble proteins of the legumes are capable of forming froth.

- This is probably of greater importance, since, bloat is observed even in animals fed with low- saponin plants.
- Factors which increase the viscosity and lowers the surface tension of ruminal contents produce froth.
- Normally, in rumen due to bacterial activity, fatty acids are produced which increase the surface tension.
- If the production of these fatty acids is decreased, the surface tension will be lowered favouring froth production.
- This is the theory behind the use of vegetable oils in the treatment of bloat.

Pathogenesis:

- ✓ Some legumes contain HCN, which is toxic, causing paralysis of the ruminal or reticular musculature and so inhibits eructation.
- ✓ Some legumes contain phosphatase which with arsenates accelerates fermentation producing a large quantity of CO₂.
- ✓ H₂S, CO₂ and CO produced in large quantities causes paralysis of ruminal muscles.
- ✓ If fed excessively on green plants only, which do not contain sufficient stiff fibres, the mucosa of the rumen is not adequately scratched to elicit the reflex contraction of the musculature.
- ✓ Mechanical stimulation of cardia, especially by roughages, increases the rate of secretion of saliva. But with ingestion of young succulent legumes, too little saliva may be secreted and so foaming is not counteracted and bloat results.
- ✓ Ruminal mucinolytic bacteria may destroy salivary mucin thereby producing frothy bloat. Polysaccharides produced by capsulated ruminal bacteria may be another etiological factor in bloat.
- ✓ Interference with the nerve pathways that are responsible for the eructation reflex may also lead to tympany. The receptors for this reflex are in the reticulum and the afferent and efficient nerve fibres are in the vagus nerve. Any lesions in this nerve may, therefore, lead to bloat.
- ✓ Distended rumen compresses other abdominal organs and causes passive congestion since the pressure on thin-walled veins impedes circulation.
- ✓ Along with this, there is forward thrust on the diaphragm, pressing on the lungs, which become smaller and sometimes atelectatic.
- ✓ The result of this is hypoxia and ultimate asphyxia and death.

Gross pathology

- ❖ In animal that dies of bloat, besides congestion of the abdominal viscera, one may notice hemorrhages on the pleura, pericardium, tracheal mucosa and on bronchial lymph nodes as well as in the lymph nodes of head and neck.
- ❖ Blood is tarry, as in Anthrax.
- ❖ Liver is pale.

- ❖ The rumen or diaphragm may be ruptured sometimes.
- ❖ Within few hours of death, the ruminal epithelium peels off.

IMPACTION OF THE RUMEN AND RETICULUM

Introduction: Here the rumen stops functioning, the musculature does not contract and so the food ingested stagnates.

Predisposing causes:

- ❖ Lack of exercise and debility predispose the animal to atony of rumen.

Aetiology:

- ✓ Overfeeding with large amounts of highly fermentable carbohydrate feeds.
- ✓ Tight packing of the rumen leaves no room for bacterial growth and normal ruminal fermentation and digestion. This leads to weak contractions of the ruminal and reticular walls and so the food does not get propelled.
- ✓ Lack of water
- ✓ Defective mastication and salivation due to defects in teeth or lesions of the tongue.
- ✓ Penetration of the wall of the rumen or reticulum by sharp objects like wire, nail etc.,
- ✓ Paresis of rumen which may occur due to injury to vagus by pressure from abscesses, tumors, tubercular nodules, swollen lymph glands and ruminal displacements.

Pathogenesis:

- ❖ The pathogenesis of atony and impaction of the rumen after ingestion of large quantities of carbohydrate rich feeds is as follows
- ❖ The carbohydrates are fermented by gram positive organisms, notably *Streptococcus bovis*, with the formation of lactic acid, resulting in to lowering of pH of the ruminal contents to as low as 4 to 4.5 from a normal 5.5 to 7.5.
- ❖ Due to the production of lactic acid the osmotic pressure of ruminal contents increases and so fluid is drawn into the rumen from the blood leading to hemoconcentration, anuria, dehydration and circulatory collapse.
- ❖ As the pH of the ruminal constituents falls, the motility of the rumen decreases and there may even be complete stasis.
- ❖ In such an atonic rumen, in which the normal microflora are lost, *Fusiformis necrophorus* and fungi of the family *Mucoraceae* (those belonging to the genera *Mucor*, *Rhizopus* and *Absidia*) invade the ruminal wall producing ruminitis and ulcers.
- ❖ At the lowered pH, normal microfloras of the rumen are destroyed, the lactobacilli and streptococci thrive and the salivary secretion ceases so that buffering action of the saliva is absent.
- ❖ Absorption of the lactate causes acidosis.

Clinical signs:

- ✓ The stagnated food becomes putrified with the liberation of the foul smelling gases.
- ✓ In some animals, diarrhoea may be present if the putrid ingesta finds its way into the intestines causing enteritis.
- ✓ Anorexia develops and regurgitation stops.

Gross pathology:

- At necropsy, the rumen will be found to contain hard, caked, undigested food with evil smelling odor.
- In animals that die of acute atony, the contents of the rumen and reticulum are thin, porridgelike and bulky.
- The cornified epithelium is soft and peels off easily, exposing hemorrhagic areas underneath.
- The blood is dark and thick.
- Lungs show bleeding into the alveoli and bronchi.
- Heart musculature is flabby.

Histopathology: In animals that survive for three days and more, demyelination of the nervous system may occur.

TRAUMATIC RETICULITIS

Occurrence: This is a very common condition in older cattle.

Pathogenesis:

- ✓ These animals ingest and swallow, along with their feed, a wide variety of sharp objects like needles, nails, pieces of fencing wire and screws.
- ✓ Sometimes contraction of the rumen and reticulum during pregnancy cause the sharp object to pierce the wall of the reticulum.
- ✓ Usually, it pierces the antero-ventral wall, which is near the diaphragm.
- ✓ The passage through it is usually slow and so the track formed by the moving nail is thickened by a dense fibrous wall.
- ✓ Piercing the diaphragm, the foreign body may enter the pericardium and even the heart, producing inflammation enroute.
- ✓ Traumatic pericarditis with serofibrinous or purulent exudates may occur.
- ✓ Sometimes, it may take a downward slope and pierce the chest wall near the xyphoid cartilage forming an abscess there.
- ✓ At the point where the object pierces the reticulum, a localized peritonitis develops causing adhesions between the reticulum and the diaphragm at this place.
- ✓ The sharp object may, sometimes, penetrate the lungs or the liver or the spleen causing abscesses in these organs.
- ✓ Penetration of vagus nerve may result into vagal indigestion.

Gross pathology:

- The thick-walled blackened track followed by the foreign body and adhesions of the reticulum to the diaphragm may be clearly seen.
- Along the track, fistulae connecting one abscess to the other may be found.
- Fibrinous pericarditis with hypertrophied myocardium may be seen if foreign body has entered the pericardium.

ULCERS OF THE FORE STOMACHS

Occurrence: Ulcers of the fore stomachs may be seen in cattle occasionally.

Aetiology:

- ✓ Usually due to *Fusobacterium necrophorum* infection.
- ✓ These ulcers may be found in animals that are started on heavy grain feed and also in calves kept on milk.
- ✓ Chemical ulceration due to corrosives may occur, though rare.
- ✓ Ulcers are seen in bovine viral diarrhoea (BVD).

PARASITES IN THE RUMEN:

Rumen of adult ruminants may contain conical flukes which may be free in the contents or attached to the rumen mucosa.



POSTMORTEM CHANGES



Postmortem changes in the rumen includes bloating with gas, sloughing of the mucosa and blackish discoloration.

MALPOSITIONS OF STOMACH

Diaphragmatic hernia of stomach

- ✚ It may be met with in dogs and cats due to automobile accidents.
- ✚ The diaphragm is ruptured and the stomach enters the thoracic cavity.

Abomasal displacement:

Introduction:

- ✓ Abomasum may be displaced either to the left or to the right.
- ✓ The left-sided displacement is more common in which it lies between the rumen and left abdominal wall.

Occurrence: This condition is met with more frequently after parturition.

Predisposing causes:

- ✚ Atony of the abomasum due to feeding large quantities of concentrates.
- ✚ Post- parturient diseases like milk fever, mastitis, metritis and ketosis may also cause atony of the abomasum.

Aetiology:

- A complication of surgical treatment for chronic indigestion.
- Violent activity like jumping in estrus may be a cause in non-parturient cases.
- A hereditary predisposition may exist.

Pathogenesis:

- During pregnancy, the rumen may be lifted by the expanding gravid uterus and the abomasum may slip under the rumen.

- After parturition, when the uterus recedes, the rumen drops to its normal position displacing the abomasum.
- The greater curvature of the body of the abomasum which is more mobile slips under the ventral ruminal sac.

Clinical signs:

- ✓ Vague and are like those of chronic indigestion
- ✓ Due to pressure, normal function of the abomasums is interfered with. Because of the abnormal position the function of the esophageal groove may be affected.
- ✓ Anorexia alternating with voracious appetite
- ✓ Ruminal tympany
- ✓ Abdominal pain
- ✓ Rapid loss of weight

Clinical pathology: Mild ketonuria is present.

Diagnosis: Laparotomy may be needed for diagnosis.

Differential diagnosis: Displacement of abomasums must be differentiated from: Chronic acetoneemia, Traumatic reticulitis, Vagal indigestion, Diaphragmatic hernia.

Rupture of stomach

Occurrence: This is common in horses

Aetiology:

- Usually due to tympanites and dilatation.
- Trauma
- Violent gastric contractions

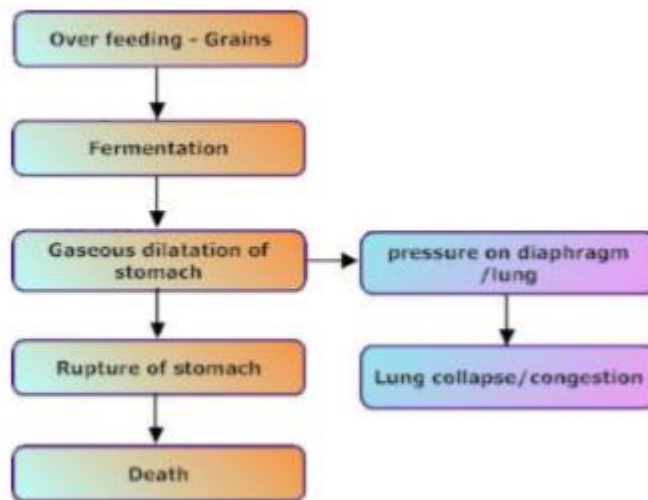
Acute dilatation of the stomach

Aetiology:

- ✓ It is due to excessive amounts of food or gas accumulating in the stomach.
- ✓ Overeating; especially with grain in horse.
- ✓ Excessive fermentation when easily fermentable foods are eaten.
- ✓ Accessory causes: Incomplete mastication due to poor teeth. Hard work immediately after feeding. Diseases of the stomach wall. Atony of the gastric musculature

Pathogenesis:

- The accumulated feed and gas in the stomach cause such a stretching of the gastric wall that contractions are interfered with.
- The stomach which is dilated presses upon other organs
- Pressure on diaphragm and lung results into dyspnoea and congestion.
- Sometimes the diaphragm may rupture.
- Obstruction of the pylorus due to a tumor or cicatricial constriction and wind sucking may cause recurrent dilatation with resultant hypertrophy of the muscular wall of the stomach.



Clinical signs:

- Stretching of stomach wall causes severe pain.
- Dilatation of the stomach causes vomition.

Gross pathology: The stomach is dilated 4 to 5 times its normal size. Lung is congested.

GASTRITIS

Definition: Inflammation of the stomach is called gastritis.

Occurrence: Gastritis is a fairly common condition in animals.

Predisposing causes: Close confinement and unsanitary conditions where bacteria thrive contaminating feeds and feeding utensils.

Aetiology: Causes may be the same for both acute and chronic gastritis but of different severity and acting for different lengths of time.

- Physical: Faulty dentition prevents mastication
- Foreign bodies may traumatize the gastric mucosa.
- Feeding very coarse material (eating bedding in horses and dogs)
- Feeding with frozen foods
- Overfeeding causing dilatation of stomach Feeding
- Spoiled, mouldy and fermented hay and silage or feeding easily fermentable foods.
- When heavily fatigued animals are fed, the feed is not easily digested, stagnates, ferments and so produces irritation.
- Too sudden changes of feed
- Toxic plants Chemicals
- Bacterial: In calves - enterotoxemia and colibacillosis; in pigs - erysipelas, vibronic dysentery, salmonellosis and colibacillosis.
- Viruses: Pig- hog cholera; transmissible gastro-enteritis in baby pigs, Cattle - rinderpest, mucosal disease, In chicken - Ranikhet disease causes haemorrhagic proventriculitis.

Fungi: Mucormycosis, moniliasis and aspergillosis cause gastritis in many animals.

Parasites:

- Stomach worms - *Trichostrongylus* sp., *Hemonchus* sp., *Ostertagia* sp., larval paramphistomes in ruminants.
- Larvae of *Habronema* sp. and *Gastrophilus equi* in horses.
- In pigs *Hyostrongylus rubidus*, *Ascarops strongylina* and *Physocephalus sexualatus*.

TYPES OF GASTRITIS

It may be primary or may be secondary to some other infections, as canine distemper, viral diarrhoea, swine erysipelas.

Gastritis may be acute or chronic.

- ❖ Acute gastritis: may be catarrhal, fibrinous, suppurative, haemorrhagic or necrotic, depending upon the cause and their severity.
- ❖ By far the most common is the catarrhal and to a lesser extent, the hemorrhagic.

Pathogenesis: In gastritis, food does not get digested. Motility of the gastric wall is retarded. Irritation may produce pain and vomiting.

Catarrhal gastritis: Gross pathology: The gastric mucosa is covered with mucus. The mucosa in some places may show ulceration. The mucosa is thick and red.

Histopathology: The mucosa shows catarrhal exudation, hyperemia and leucocytic infiltration. Some of the gastric glands may be damaged and lost.

Acute hemorrhagic gastritis:

Occurrence: This is a common condition.

Aetiology:

- Caustic chemical poisoning
- uremia
- acute infectious diseases like pasteurellosis, braxy, leptospirosis (in dogs).

Gross pathology: Due to haemorrhage, the mucosa is bright red in color and the gastric contents are blood stained. Digested blood (acid haematin) imparts a brownish coloration to the contents.

Parasitic Gastritis

Occurrence: This is very common in animals.

Aetiology:

- Cattle and sheep: *Hemonchus contortus*, *Ostertagia ostertagi*, *Trichostrongylus axei*
- Horses: *Habronema* larvae, *Trichostrongylus axei* and *Gastrophilus equi* larvae.
- Pig: *Hyostrongylus rubidus*, *Physocephalus sexualatus*, *Simonsia paradoxa*, *Ascarops strongylina*.
- Cats: *Gnathostoma spinigerum*

Pathogenesis: The strongyles are blood suckers and they produce minute injuries on the mucosa. The larvae may burrow into the mucosa for completion of their life cycle and thereby cause

damage to the epithelium and glands. Heavy infestation besides causing anemia will produce catarrhal gastritis.

Gross pathology: *Gastrophilus* sp. in the stomach may produce ulcers. *Habronema* larvae live in granulomatous nodules which may be infected by secondary bacteria and form abscesses.

Chronic gastritis

Aetiology:

- Usually the same causes as for the acute but operating for a longer time.
- Sometimes it may be secondary to chronic gastric dilatation and cirrhosis.

Pathogenesis: Ischaemia in gastric dilatation and passive hyperemia and failure of detoxication in cirrhosis decrease the local resistance thereby facilitating infection.

Gross pathology: The mucous membrane is thickened and covered with tenacious, viscid glassy mucus. This condition is usually of a hypertrophic type with thickening of the gastric wall.

Histopathology:

- There is exfoliation of the epithelium.
- Hyperplasia of gastric glands and muscle fibres along with cellular infiltration and hyperplasia of basal lymphocytic nodules.
- The mucosa may be thrown into polypoid folds (polypoid gastritis)
- The interstitial connective tissue hyperplasia exaggerates the mucosal foldings.
- Occlusion of glands results into development of retention cysts.

GASTRIC ULCERS

Occurrence:

- ✓ Gastric ulcers are common among animals.
- ✓ Small superficial defects are known as erosions which are common among ruminants.
- ✓ Calves are more often affected.

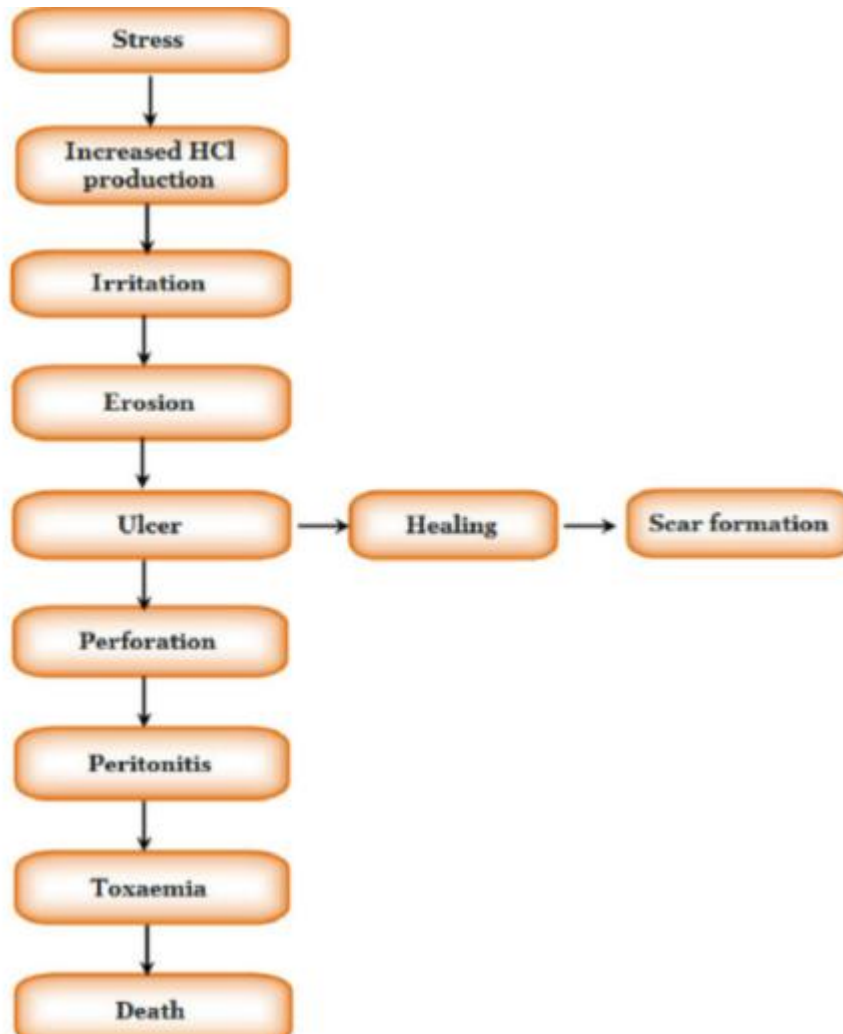
Aetiology:

- Trauma: This is the commonest cause of abomasal ulcers in calves.
- Obstruction of pylorus in cattle. In calves - by foreign bodies or coarse feed. In adult cattle - traumatic reticulitis and abomasal displacement
- Chemicals: May act either directly on the mucosa or indirectly through their action on the nerves.
- Grazing on pastures heavily fertilized with nitrogen.
- Nutrition: Nutritional hepatic dystrophy (due to deficiency of vitamin E) in pigs
- Fungi; *Mucor* sp and *Monilia* sp cause gastric ulcers in pigs.
- Circulatory disturbance; In intense passive hyperemia with focal hemorrhages lead to epithelial necrosis.

Neoplasms of the stomach

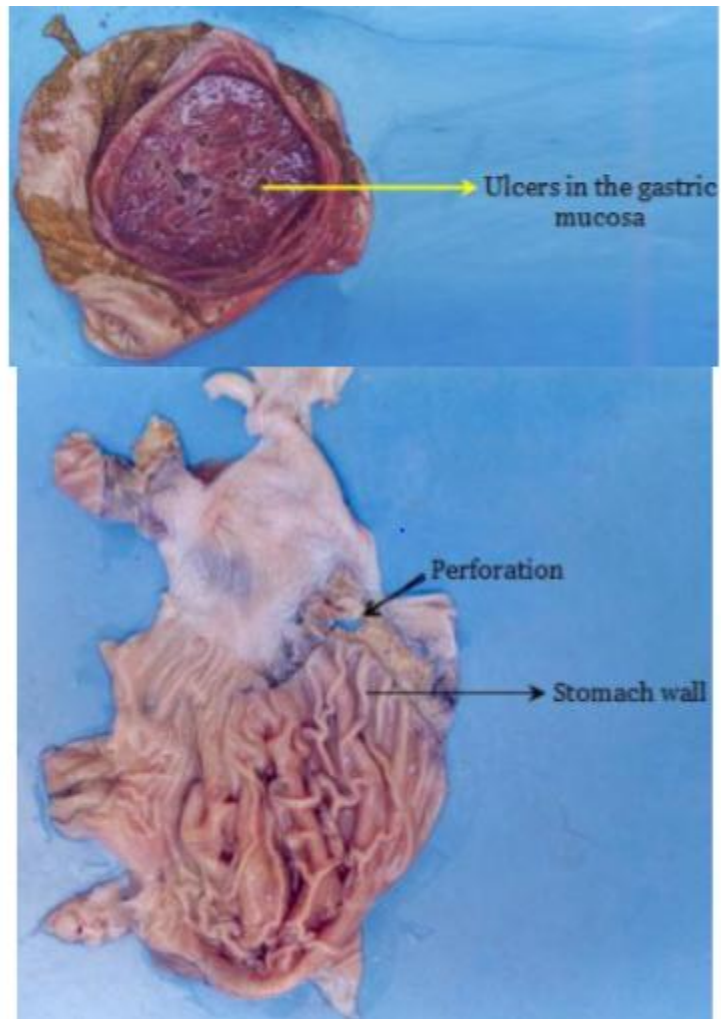
- ❖ Lymphocytoma of stomach wall is accompanied by ulceration.

Pathogenesis



Gross pathology

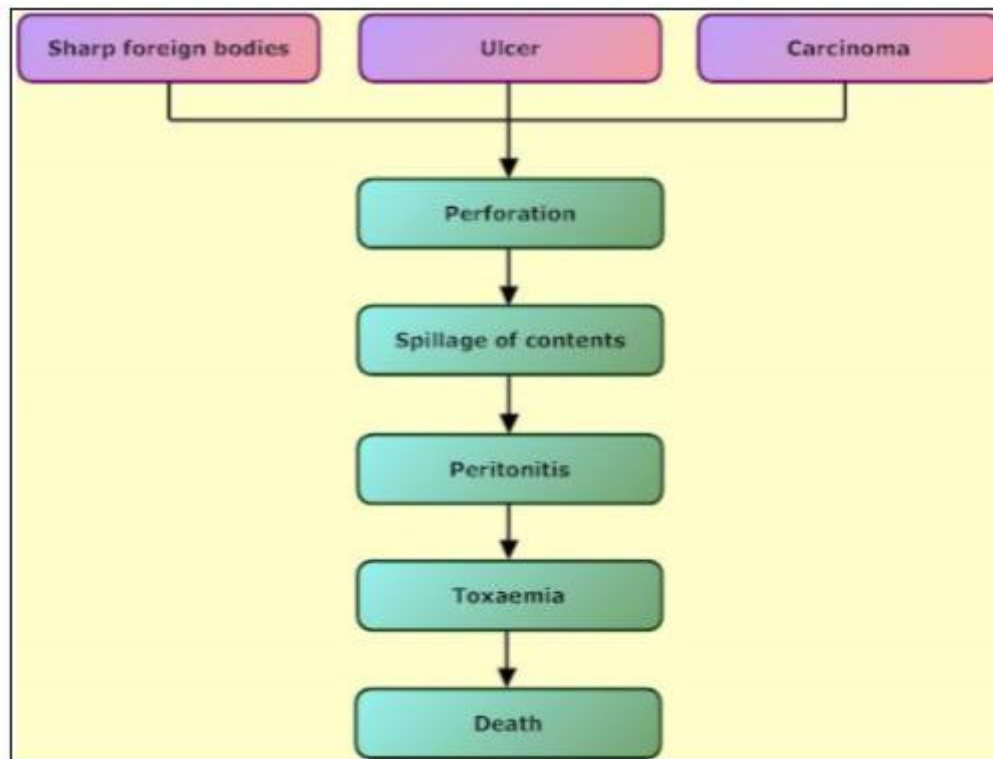
- ✓ The mucosal erosions (in cattle) are of the size of a millet.
- ✓ Slowly, by the action of the gastric juice the erosions may enlarge and become deeper to form ulcers.
- ✓ The ulcers are usually demarcated, having raised borders with a punched-out appearance.
- ✓ The base of the ulcers may be the submucosa or muscular coat or in some cases even the serosa.
- ✓ When the serous coat is the base, perforations are likely to occur.



Histopathology

- ❖ The erosion is covered by an exudate consisting of mucus, fibrin and inflammatory cells.
- ❖ The epithelium is exfoliated.
- ❖ The sub-mucosa may be infiltrated by large number of leucocytes.

Perforation of stomach wall



Neoplasms of the stomach wall

- ✓ Most common is lymphosarcoma of the abomasum in the bovines.
- ✓ Other tumors seen are leiomyoma and adenocarcinoma.

PATHOLOGY OF INTESTINE

Congenital anomalies

Atresia of the intestine: It may be found as a hereditary defect among cattle.

Atresia of rectum: In pigs and foals, atresia of rectum is an inherited lethal characteristic.

Imperforate anus: In cattle, imperforate anus at birth is a semi-lethal character.

Persistent omphalomesenteric duct (Meckel's diverticulum). In pigs and horses, it is probably a hereditary defect. It may become obstructed or inflamed or even ruptured resulting in peritonitis. Stenosis of the intestines sometimes occurs congenitally.

Postmortem changes in intestine

Postmortem changes in intestine include ballooning of intestine, thickening of intestinal mucus, blackening of intestinal mucosa (pseudomelanosis coli) and sloughing of intestinal mucosa.



INTESTINAL TYMPANY

Definition: Distension of intestine with gas

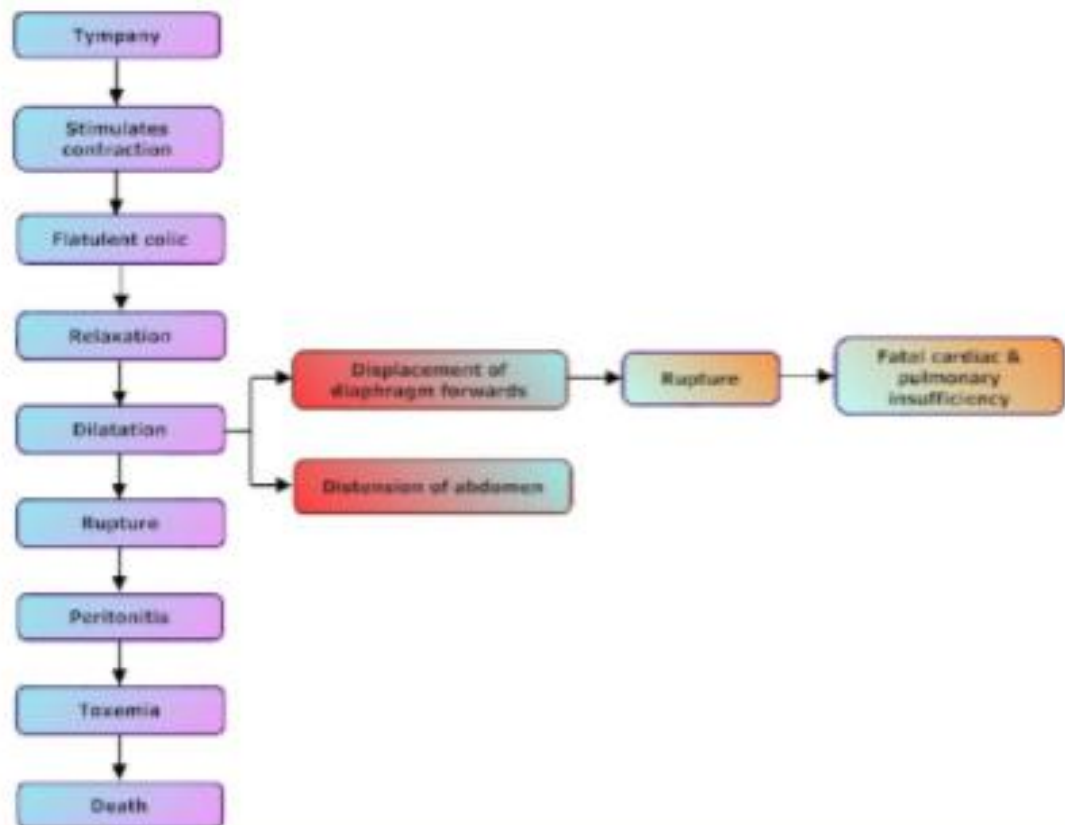
Occurrence: Very frequent in horses, rabbits and dogs.

Etiology

Acute: As for gastric tympany, Intestinal obstruction, Atresia of intestine

Chronic: Accumulation of contents in certain parts of intestine, Dry, coarse insufficiently masticated feed, Decreased secretion, Intestinal adhesion / stenosis, Regional ileus, Enlarged prostate gland.

Pathogenesis



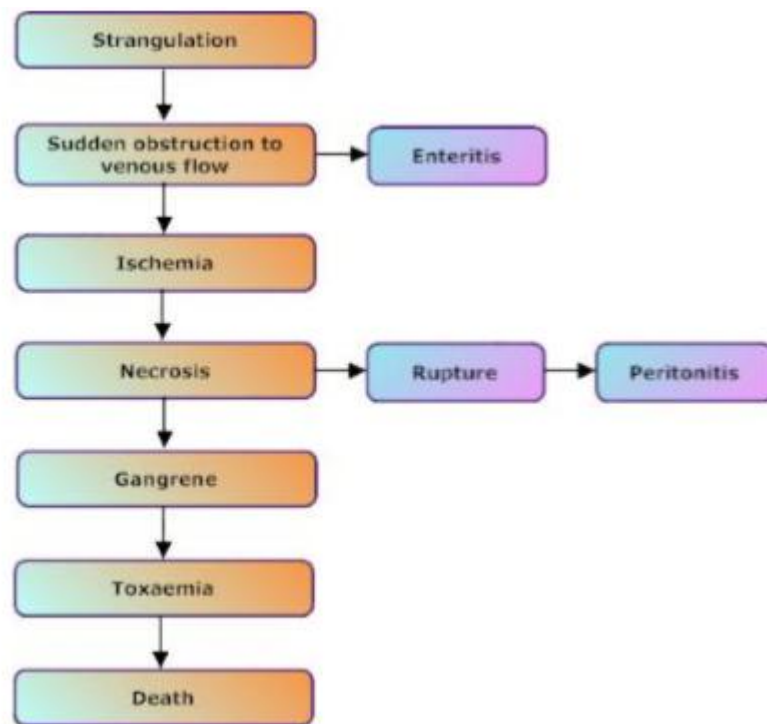
CIRCULATORY DISTURBANCES

- ✓ Acute passive hyperemia
- ✓ Chronic passive congestion
- ✓ Hemorrhages
- ✓ Infarction
- ✓ Thrombosis
- ✓ Embolism

ACUTE PASSIVE HYPEREMIA

Occurrence: Occurs in conditions where there is sudden obstruction to the venous out flow as in prolapse, torsion, hernia or intussusception.

Pathogenesis



Gross pathology:

- There may be effusion into the peritoneal cavity.
- The involved part is dark-red and swollen due to haemorrhage and oedema.
- The intestinal wall is edematous with hemorrhages.

HEMORRHAGES

Occurrence: Haemorrhages are common on the mucosa and serous surface of the intestines.

Etiology: Specific infections in which this is a lesion. Enterotoxaemia (in sheep). Blood sucking parasites. Hemorrhagic diseases.

THROMBOSIS

Occurrence: Thrombosis of the intestinal vessels is common in the horses and is mostly due to larvae of *Strongylus vulgaris*.

Pathogenesis

- The infective larvae burrow into the mucosa and travel along the intestinal arteries, crawling against blood flow along the intima and reach the anterior mesenteric artery where they settle.
- At that place the endothelium is damaged and a thrombus is formed.
- This thrombus may become organized and canalized.
- Complete organization of the thrombus is prevented by the penetration of larvae which produce irritation.
- The damage caused by the penetration of larvae as well as their continued presence weakens the wall of the artery leading to aneurysm. Replacement of the elastic tissue by fibrous tissue with lack of resilience of the arterial wall also contributes to aneurysm.
- The wall may sometimes rupture.
- Calcification of the fibrosed wall may sometimes further weaken the wall.
- Of various branches of the anterior mesenteric artery, it is in the right branch that thrombus more often occurs. This branch supplies the ventral colon and so thrombosis of the vessel produces ischemia of these parts.
- Thrombosis more often occurs in the right branch of anterior mesenteric artery, hence, ischaemia is more frequent in ventral colon.

MECHANICAL OBSTRUCTION

TORSION

Definition: Torsion is a twisting of intestines on its axis.

Occurrence: It is frequent in horses. This may also be seen in other animals

Etiology

- Torsion occurs more often in the small intestines which have a long mesenteric attachment.
- In the horse, the right colon is fixed by ligaments and so torsion occurs in the left and transverse colon.
- In the cattle torsion of cecum is more common.

Pathogenesis: The changes that occur in torsion are acute passive congestion leading to edema, hemorrhage, gangrene, peritonitis and death.

VOLVULUS

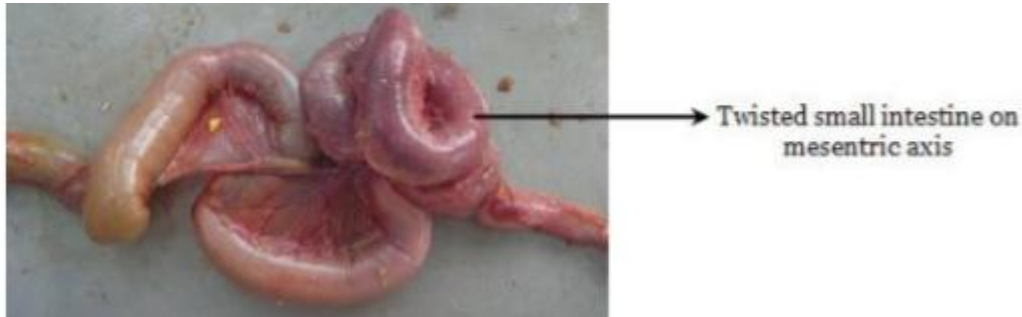
Definition: Volvulus is a twisting of the bowel on itself as occurs when it passes through a tear in the mesentery.

Occurrence: This condition is more frequently seen in horses. May also be met with in other animals.

Etiology

- Violent movements as in rolling and struggling.
- Violent peristaltic movements.
- Foreign bodies: sand or enteroliths by their weight make the part heavy and aid in its winding around other parts.
- Gas: Accumulation of gas makes the part bulge and twist round other viscera.

Gross pathology: The affected portion is swollen and darkened in color. The wall is very easily torn. Peritonitis may be evident in some cases.



INTUSSUSCEPTION

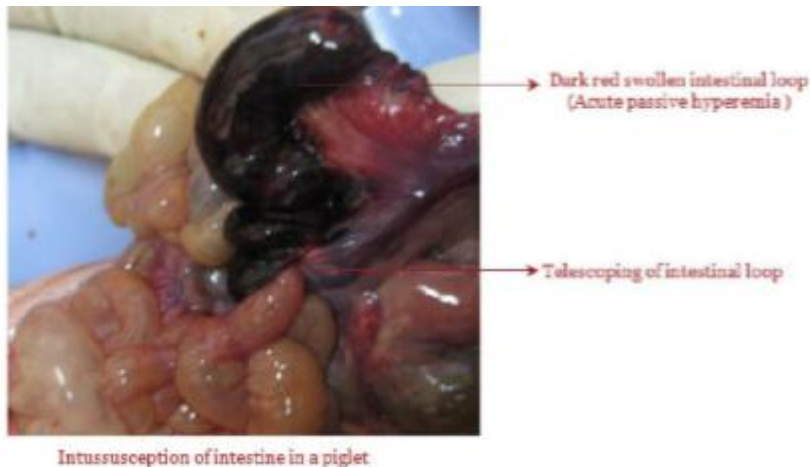
Definition: Intussusception is telescoping of a portion of intestine into another, usually the anterior into the posterior.

Occurrence: It occurs mostly in the jejunum and cecum in dogs and cattle.

Pathogenesis: Along with the portion of intestines, its mesentery is also dragged along and so there is compression of the thin-walled veins resulting in acute local passive hyperemia.

Gross pathology: The affected part is dark-red or bluish and swollen.

Sequelae: Usually gangrene and peritonitis supervene terminating in death. In some stray cases, the invaginated portion may be sloughed off healing occurring by granulation tissue. Epithelium covers the scar. But at the site of scar circular stenosis may form.



PROLAPSE OF THE RECTUM

Definition: This is protrusion of the rectum through the anus.

Etiology: The causes are straining, irritation, abdominal pressure, diarrhoea, increased peristalsis and constipation.

Gross pathology: The changes are due to venous compression and acute local passive hyperaemia. The rectum is hyperaemic and will be found hanging through the anus. It may be edematous and soon becomes gangrenous.

HERNIA

Definition: Hernia of the abdominal organs is the protrusion of the abdominal viscera through a natural or artificial opening.

Occurrence: Hernia of intestines is commonly seen in domestic animals, especially the pig and horse.

Etiology: The intestines may pass through a natural opening, the internal inguinal opening which is patent in the males. The umbilicus, if not healed is another site of hernia. Trauma when the abdominal muscles may rupture or even the diaphragm may tear resulting in the intestines passing through the opening. Violent straining during parturition or defecation.

Types: Depending upon the location, hernia may be external or internal (diaphragmatic, pelvic).

- If the hernial contents can be returned in to the abdominal cavity, it is called reducible hernia .
- If the hernial contents cannot be so returned it is called irreducible hernia. The causes of the latter are
 - A. Adhesions between the visceral mass and the hernial sac.(The adhesions arise due to inflammation of the peritoneum)
 - B. Accumulation of ingesta in the loop of intestines making it too bulky to be reducible and

C. Venous stasis, oedema and incarceration, whereby the volume is so increased and the bowel cannot be reduced.

- If the hernia does not have a parietal peritoneal covering of the viscus, it is called a false hernia.
- In such cases, opening of the skin will reveal the bowel. The condition is called eventration. External hernia consists of :
 - A hernial sac formed by the parietal peritoneum and the covering skin
 - A hernial ring which is the opening in the abdominal wall and
 - The hernial contents.

Umbilical hernia: The umbilical when the bowel passes through a congenital or acquired defect of umbilicus. It is seen in foals, calves and pups.

Inguinal hernia: In inguinal hernia, the bowel passes through the internal inguinal ring. This is not so common in animals as in man, because of horizontal position: seen in colts and pigs.

Scrotal hernia: Here the intestines slide into the tunica vaginalis along the inguinal canal in contact with the spermatic cord. The testes may undergo thermal atrophy as it is in contact with the intestines.

Femoral hernia: Femoral hernia may develop when the omentum and intestines pass through the femoral triangle along the femoral artery. Here the bowel is found on the inner surface of the thigh.

Perineal hernia: The perineal hernia may occur in old dogs. o It may be due to violent straining as in case of enlarged prostate.

Strangulated hernia: This is one in which the blood supply is cut off by the pressure of the hernial ring through which the intestines pass. If not relieved in time, this condition is fatal since infarction, gangrene, peritonitis and shock will develop within 24 to 36 hours.

ENTERITIS

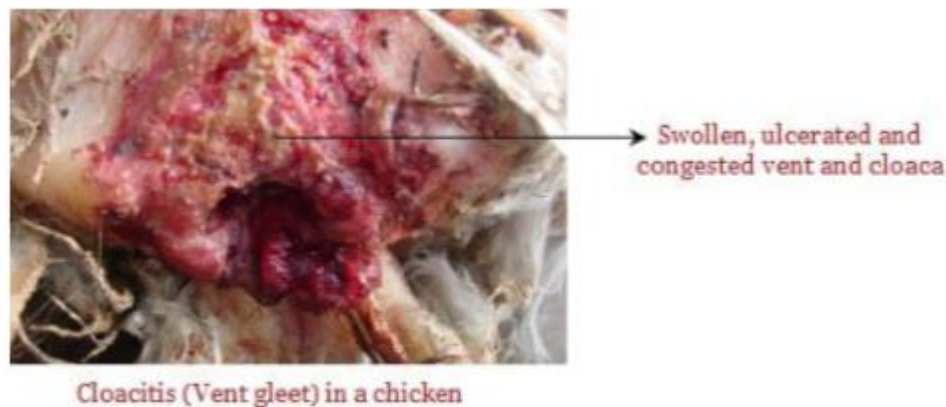
Definition: Enteritis is inflammation of the whole of the intestinal tract. But usually it is applied to the inflammation of the small intestines. The inflammation of the colon is called colitis, that of cecum typhlitis, that of rectum proctitis and of cloaca cloacitis or vent gleet.

Introduction: Enteritis is of immense economic importance.

Occurrence: Enteritis is very common in domesticated animals and fowls. Since enteritis occurs along with gastritis (the same irritants causing gastritis passing on to intestines produces enteritis also) gastro-enteritis is a frequent condition met with.

Etiology: Causes are many and varied and they include chemicals, bacteria, viruses, protozoa, rickettsia, helminths, fungi, disturbed metabolic processes as in ruminants, venous congestion as in portal hypertension and congestive cardiac failure, toxins of Clostridia, coliforms and spoiled or mouldy feeds and avitaminosis.

Gross pathology: In enteritis, the whole length of the bowel may not be affected, inflammation localizing only at one part or the other.



TYPES OF ENTERITIS

Based on the nature of the exudate and the changes produced in the intestinal tract, enteritis is classified as follows.

- ✓ Catarrhal Enteritis
- ✓ Hemorrhagic Enteritis
- ✓ Fibrinous Enteritis
- ✓ Suppurative Enteritis
- ✓ Necrotic Enteritis

CATARRHAL ENTERITIS

Acute Catarrhal Enteritis: This is the mildest of inflammation of the intestinal tract, occurring in a diffuse manner throughout the bowel.

Predisposing causes: In calves and lambs avitaminosis A is a predisposing factor while in young pigs deficiency of animal proteins and trace elements predispose them to infections. In such a state, the organisms are able to gain a foothold and thrive causing the disease.

Aetiology:

- Causes include mild irritants like foreign bodies, sand, coarse feeds, chemicals, bites of parasites (hook worms), *Vibrio coli* (causing winter diarrhoea in cattle) and drugs.
- Acute catarrhal enteritis may be noticed in o Enteritis in sucklings – scours in calves, lambs, foals and piglets caused by *E.coli*, *Pasteurella*, *Salmonella*, *Proteus*, *Vibrio* and *Streptococci*.
- Enterotoxemia in sheep.
- Viral Diarrhoea -Mucosal Disease in cattle.
- Virus gastroenteritis in pigs.
- Salmon poisoning in dogs.
- Salmonellosis, infectious cloacitis, pullet disease and ornithosis in fowls.
- Oral antibiotic therapy may cause enteritis in two ways

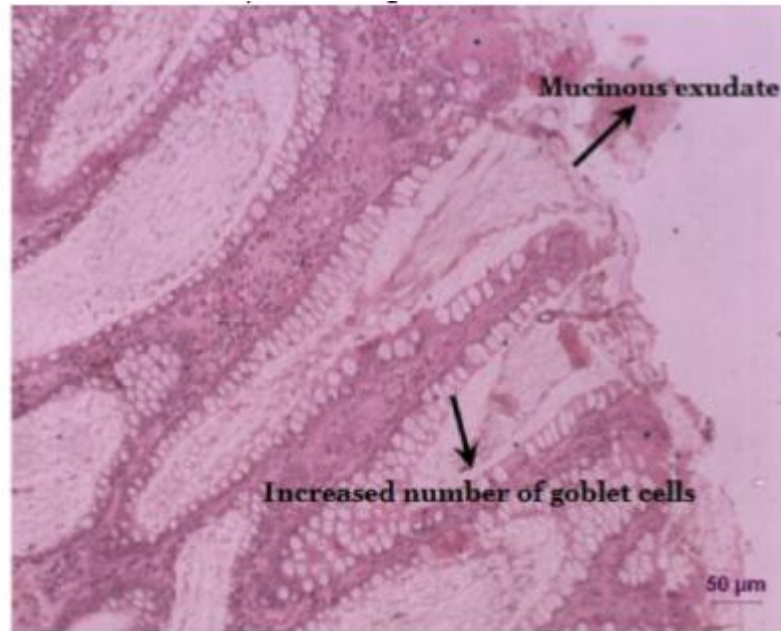
Gross pathology

- ❖ One should be able to distinguish this condition from the normal hyperemia that occurs during active digestion.
- ❖ The intestinal contents are watery
- ❖ The mucosa is reddish in color and slightly thickened, covered with a mucinous exudate.
- ❖ The Peyer's patches are prominent being hyperplastic, outlined by a zone of hyperemia.



Histopathology

- ✓ The intestinal contents consist of mucus, fibrin and exfoliated epithelial cells.
- ✓ Goblet cells are numerous and produce large amounts of mucin
- ✓ The tips of villi may be hyperaemic and edematous.
- ✓ There is infiltration with leucocytes in the lamina propria and to a little extent in the submucosa.



Catarrhal enteritis

HEMORRHAGIC ENTERITIS

This is a more severe form of enteritis, characterized by the presence of erythrocytes in the exudate.

Aetiology :

- ✓ This is mostly seen in septicemic bacterial and viral diseases e.g Anthrax and Rinderpest.
- ✓ Poisoning by arsenic and croton oil
- ✓ Colibacillosis
- ✓ Enterotoxemia
- ✓ Coccidiosis

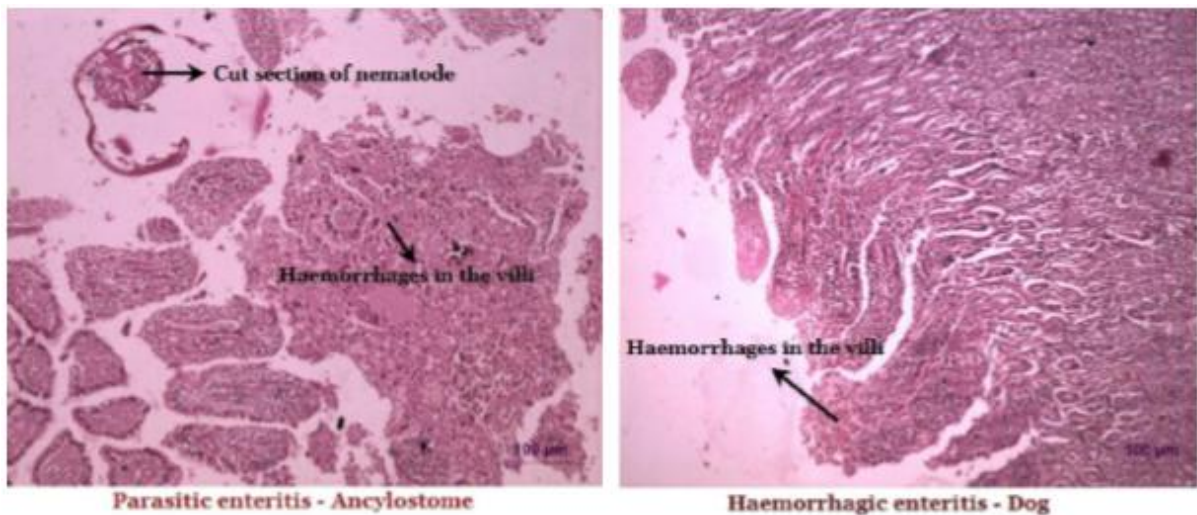
Gross pathology:

- ❖ Always patchy in distribution
- ❖ The intestinal contents are blood stained.
- ❖ Blood found in the anterior portion of the intestines is digested and so is brown in color while in the posterior portion it is bright red.

Histopathology:

- ✓ Red blood cells may be found in the exudate of the mucosa.
- ✓ The villi may show necrotic changes.
- ✓ The intestinal wall shows haemorrhages.

- ✓ Thrombosis of some enteric vessels is evident.

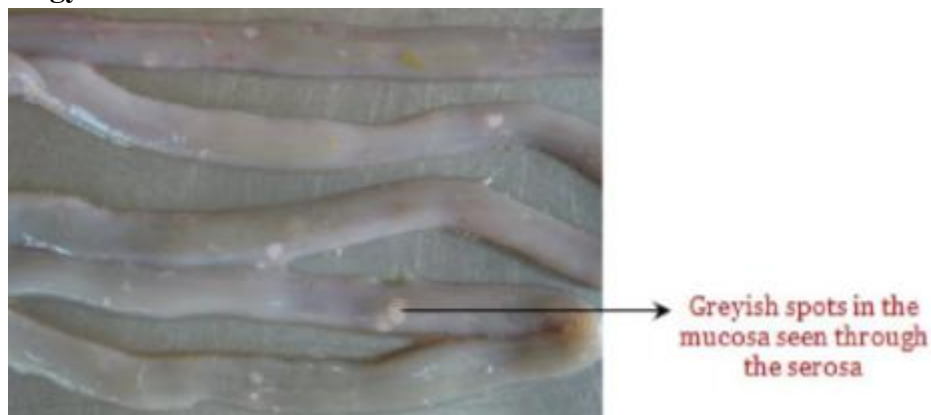


NECROTIC ENTERITIS

Here necrosis of the intestinal epithelium and underlying tissues occurs.

Etiology: Severe irritants: Chemical- croton oil, mustard gas, wood preservatives; insecticides. Bacteria- *Fusiformis necrophorum* and *Salmonella* sp. Viral diseases - Rinderpest, Viral Diarrhoea- Mucosal Disease, Hog cholera. Protozoal diseases - Coccidiosis and histomoniasis. Vitamin deficiency – Niacin deficiency in swine.

Gross pathology



- ✓ Patchy necrotic areas are seen
- ✓ Fibrin may be found on the necrotic mucosa.
- ✓ When the necrotic material is removed, a red, raw, bleeding surface is seen.
- ✓ The necrosis of the mucosa extends into the sub-mucosa also.
- ✓ The mesenteric lymphatic nodes are swollen and juicy.
- ✓ In hog cholera, the characteristic lesion is the “button ulcer”, which is a spherical ulcer in the mucosa of the colon. This is circumscribed with sharp edges.

Histopathology:

- Necrosis of enterocytes is seen.
- The mucosa shows hyperemia and cellular infiltration.
- The ulcer reveals a demarcated zone of necrosis in the mucosa and sub-mucosa.
- The button ulcers are tiny areas of infarction that arise by the occlusion of small arteries by the swollen and proliferated endothelium.

Chronic Catarrhal Enteritis

Aetiology: It may develop from the acute condition or more usually it may arise gradually as in Johne's disease, intestinal helminthiasis, chronic venous congestion (due to congestive cardiac failure) and cirrhosis of liver.

Gross pathology: The wall of the intestines is greatly thickened. The mucosa is smooth (covered by thick mucus). The corrugations are sometimes present at right angles to the length of the intestines (Chronic polypoid enteritis).



Histopathology: The mucosa is thickened. The mucosa is covered with thick mucus. The characteristic appearance is the presence of numerous macrophages, plasma cells, lymphocytes and connective tissue cells in the lamina propria and even in the sub-mucosa.

