RENAL SYSTEM - 4

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MISCELLANEOUS CHANGES

Pulpy Kidney Disease (enterotoxaemia)

- This classic enterotoxaemia of sheep is seen less frequently in goats and rarely in cattle.
- It is worldwide in distribution and may occur in animals of any age.
- It is most common in lambs that are either <2 wk old or weaned in feedlots and on a high-carbohydrate diet or, less often, on lush green pastures.
- The causative agent is *Clostridium perfringens type D.*
  - However, predisposing factors also are essential; the most common of these is the ingestion of excessive amounts of feed or milk in the very young and of grain in feedlot lambs.

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- In young lambs, the disease usually is restricted to the single lambs because a ewe with twins seldom gives enough milk to allow enterotoxaemia to develop.
- In the feedlot, the disease usually occurs in lambs switched rapidly to high-grain diets. As the starch intake increases, it provides a suitable medium for growth of the causative bacteria, which produce å toxin.
- A major effect of the toxin is to cause vascular damage, particularly of capillaries in the brain.
- Many sheep carry strains of *C perfringens type D as part of the normal microflora of the intestine and serve as the source of organisms to infect the newborn.*
- Most such carriers have nonvaccinal antitoxin titres.

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Clinical Signs

- Usually, sudden deaths in the best-conditioned lambs are the first indication of enterotoxaemia.
- In some cases, excitement, incoordination, and convulsions occur before death.
- Opisthotonos, circling, and pushing the head against fixed objects are common signs of CNS involvement; frequently, hyperglycaemia or glucosuria is seen.
- Diarrhea may or may not develop.
- Occasionally, adult sheep are affected; they show weakness, incoordination, and convulsions and die within 24 hour.
- In goats, the course of disease ranges from peracute to chronic, with signs that vary from sudden death to watery diarrhea with or without blood.

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- Acutely affected calves not found dead show mania, convulsions, blindness, and death in a few hours.
- Subacutely affected calves are stuporous (dreamy) for a few days and may recover.
- In goats, diarrhoea and nervous signs are seen, and death occurs in several weeks.
- Type D enterotoxaemia occasionally occurs in young horses that have overeaten.

Lesions

- Necropsy may reveal only a few hyperaemic areas on the intestine and a fluid-filled pericardial sac.
- This is particularly the case in young lambs.

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- In older animals, haemorrhagic areas on the myocardium may be found as well as petechiae and ecchymoses of the abdominal muscles and serosa of the intestine.
- Bilateral pulmonary edema and congestion frequently occur but usually not in young lambs.
- The rumen and abomasum contain an abundance of feed, and undigested feed often is found in the ileum.
- Oedema and malacia can be detected microscopically in the basal ganglia and cerebellum of lambs.
- Rapid postmortem autolysis of the kidneys has led to the popular name, pulpy kidney disease; however pulpy kidneys are by no means always found in affected young lambs and are seldom found in affected goats or cattle.
- Haemorrhagic or necrotic enterocolitis may be seen in goats.

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Diagnosis

- A presumptive diagnosis of enterotoxaemia is based on sudden, convulsive deaths in lambs on carbohydrate-rich feed.
- Smears of intestinal contents reveal many short, thick gram-positive rods.
- Confirmation requires demonstration of å toxin in the small-intestinal fluid.
- Fluid, not ingesta, should be collected in a sterile vial within a few hours after death and sent under refrigeration to a laboratory for toxin identification.
- Chloroform, added at one drop for each 10 mL of intestinal fluid, will stabilize any toxin present.

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- Although immunologic tests have been developed to replace the traditional mouse assay for detection of toxin, they are less sensitive than the mouse assay.
- A polymerase chain reaction protocol for detetion of the gene for å toxin is effective in identifying isolates as either type B or D.

PIGMENTARY CHANGES

Haemoglobin Discolouration of the Kidney

- Haemoglobinuria accompanies intravascular haemolysis and the haemoglobin will impart a dark reddish discolouration on the renal parenchyma.
- Initially the discolouration is uniform but after a short period of time the haemoglobin is lost from most nephrons and remains in a few causing a brownish speckled appearance.

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- Microscopically, the haemoglobin is found in small eosinophilic granules in tubular epithelial cells and in casts in more distal portions of the nephron.

Myoglobin Discolouration of the Kidney

- Myoglobin may leak from damaged or necrotic muscle cells into the vascular system.
- Once in the blood, the myoglobin is filtered in the glomerular ultrafiltrate into the nephron where it imparts a brownish discolouration to the kidney.
- The discolouration associated with myoglobin is very similar to that seen with haemoglobin.

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Histologically

- the myoglobin is found in small eosinophilic granules in tubular epithelial cells and in casts in more distal portions of the nephron.

Haemosiderosis

- Haemosiderosis develops subsequent to chronic hemolytic anaemia and as residues of acute hemolytic anaemia.
- The pigment is produced by degradation of resorbed haemoglobin and is usually found in renal tubular epithelial cells.
- It usually imparts a brownish discolouration on the kidney.

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Lipofuscinosis

- Lipofuscinosis is a condition in which a brownish iron-free pigment is deposited in tissues.
- This pigment is called lipofuscin and the condition is also known as haemochromatosis and xanthomatosis.

Grossly

- there are brownish streaks in the cortex radiating from the medulla.

Microscopically

- the pigment is found in convoluted tubules.

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Other Pigmentary Changes

- The porphyrins of congenital porphyria impart a brownish discolouration on the kidneys, with accumulations of the pigment in tubular epithelium and in the interstitium.
- A greenish-yellow discolouration of the kidneys is common in icterus.
- Hyperbilirubinaemia of any cause may result in a dark brownish to black discolouration of the kidneys as well.

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PARASITIC LESIONS

Dioctophyma Renale

- Dioctophyma renale is the giant kidney worm.
- It is mainly reported in dogs, mink, cats, and other fish eating mammals but it has been reported in pigs, cattle and horses.
- It is the largest parasitic nematode ranging in size from 20 - 100 cm **in length and 4 - 12 mm in diameter.**
- It has an indirect life cycle involving two intermediate hosts.
- Adult worms are usually found in the renal pelvis and they usually cause extensive damage to the renal parenchyma.

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Capillaria Spp.

- There are several species of capillaria that infect the urinary tract of animals.
- ***Capillaria plica*** *(in dogs), Capillaria micronata (in mink) and Capillaria feliscati (in cats) have been found infecting the renal pelvis, ureteres and urinary bladder.*

RENAL NEOPLASIA

- Primary neoplasms of the kidney are rare.
- They include renal adenomas, renal carcinomas, nephroblastoma, transitional cell papilloma, transitional cell carcinoma, fibroma, fibrosarcoma, hemangioma, and hemangiosarcoma.

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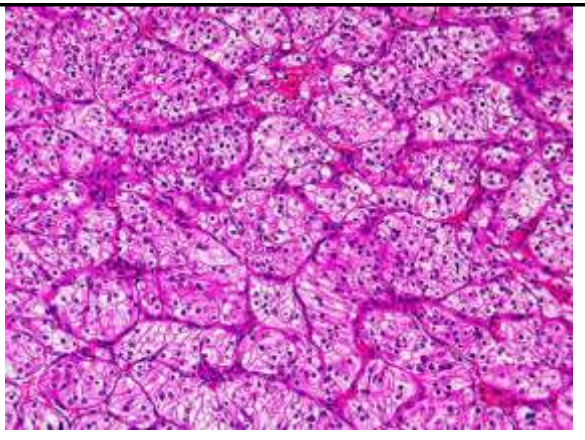

Renal Cell Carcinoma: The tumor cells have rounded polygonal shape and abundant clear cytoplasm (most common cell type in this carcinoma). The stroma is scant but highly vascularized.

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DISEASES OF THE LOWER URINARY TRACT

Haemorrhage

- Haemorrhage can occur at any location in the lower urinary tract and most often it develops due to local irritation or trauma.
- Urinary calculi are commonly associated with lower urinary tract hemorrhage.
- Improper insertion of catheters is another common cause of lower urinary tract bleeding.

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Urolithiasis

- Urolithiasis is one of the most important urinary tract problems in domestic animals.
- It refers to the presence of calculi in the urinary passages.
- These calculi form by precipitation of urinary solutes and they may be found in any part of the urinary collecting system including the
  - renal pelvis,
  - the ureters,
  - the urinary bladder, and
  - the urethra.

Nephrolithiasis in a horse.

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- Numerous predisposing and precipitating factors have been reported and these vary for the different types of calculi that are found.
- The calculi basically cause disease by obstructing flow in the urinary tract; however, they can be locally irritating and cause problems without causing obstruction.

Renal calculus in situ

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Inflammation of the Lower Urinary Tract

- Cystitis refers to inflammation of the bladder.
- Infection of the bladder is rare and it usually develops subsequent to interference with urine flow or damage to urinary tract epithelium.
- In bacterial infections, usually the pathogens can be traced to the rectal fora.
- The more commonly isolated pathogens include *E. Coli, Proteus vulgaris, streptococci, staphylococci, Corynebacterium renale (in cattle),* ***and Corynebacterium suis (in swine).***
- Cystitis often leads to ureteritis and urethritis which are inflammation of the ureters and urethra, respectively.

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Neoplasms of the Lower Urinary Tract

- Neoplasms of the lower urinary tract are most frequently reported in cattle and dogs.
- In cattle, most of these neoplasms have been associated with enzootic hematuria.
- Primary neoplasms include leiomyomas, leiomyosarcomas, fibromas, fibrosarcomas, rhabdomyosarcomas, adenomas, papillomas, carcinomas, transitional-cell carcinoma, squamous-cell carcinoma, adenocarcinoma, and undifferentiated carcinomas.
- More commonly encountered secondary neoplasms in the lower urinary tract usually spread from local primary neoplasms of the prostate, rectum, and other surrounding organs or structures.
- Occasionally, in cattle, lymphosarcoma will metastasize to the bladder.

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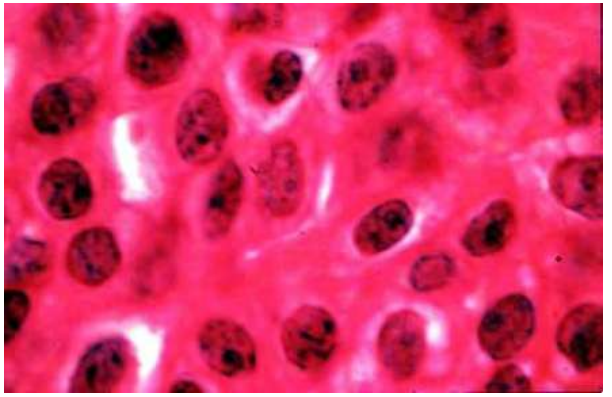

Transitional cell carcinoma, canine bladder

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