

## RENAL SYSTEM - 3

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## DISEASES OF RENAL TUBULES, INTERSTITIUM, PELVIS

- Renal tubules and the interstitium are closely related, and defects involving one tend to cause problems in the other.
- Regeneration of tubular epithelium can occur, if the basement membranes are preserved,
- The **response** of the kidney to injury is limited to hypertrophy of existing nephrons.
- Renal tubular epithelial cells suffer from degenerative changes similarly to many other cell types.
- These changes may be manifested as cellular **swelling**, **hydropic degeneration**, and/or **fatty change**.




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- Various types of **inclusion bodies** are reported in renal tubular epithelial cells.
  - These include viral inclusions, inclusions of unknown origin, and inclusions from accumulation of material from the ultrafiltrate.
- Some conditions are characterized by thickening of the tubular basement membranes.
- In renal amyloidosis, amyloid is deposited in tubular basement membranes as well as in glomeruli.

### TUBULOINTERSTITIAL DISEASES

- In most cases, conditions those cause tubular damage also cause changes in the interstitium,




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- Also, conditions affecting the interstitium usually cause glomerular damage,
- hence it is possible for an interstitial problem to cause kidney failure, renal failure, and the nephrotic syndrome.

### Non-suppurative Interstitial Nephritis

- An inflammatory condition involving primarily the interstitium of the kidney.
- The causes are not usually identified, especially in chronic cases, and they probably vary considerably.
- It may be **acute** or **chronic** and multifocal or generalized.
  - **Acute** cases are characterized by sudden onset and histologically there is **oedema** and accumulations of **leukocytes** in the interstitium and focal **tubular necrosis**.



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- In **chronic** cases, **mononuclear** cell infiltration and **connective tissue** proliferation in the interstitium are the dominant histopathologic features.
- Likely pathogens for non-suppurative interstitial nephritis include *Leptospira*, *canine adenovirus-1* in dogs and *Leptospira pomona* in cattle and swine.
- It has also been reported in
  - "white spotted kidney" **of calves**,
  - MCF in cattle,
  - theileriosis in cattle,
  - "lumpy-skin disease" **in cattle**,
  - Sheep pox in sheep
  - equine infectious anaemia in horses.



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White spotted kidney in Cattle of miliary distribution



<http://www.cresa.cat/blogs/sesc/ronyo-de-taques-blanques-en-un-bovi/?lang=en>



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### Suppurative Interstitial Nephritis

- Refers to a **pyogenic** inflammatory condition involving primarily the interstitium of the kidney.
- It is usually caused by pyogenic bacteria which may reach the kidney via **haematogenous** routes (usually resulting in embolic suppurative nephritis) **or urogenous routes** (usually resulting in pyelonephritis).
  - Embolic suppurative nephritis usually develops when bacteria are seeded into the kidney parenchyma, either during a bacteremia or in septic emboli.
  - The most common cause of embolic suppurative nephritis in horses is *Actinobacillus*.

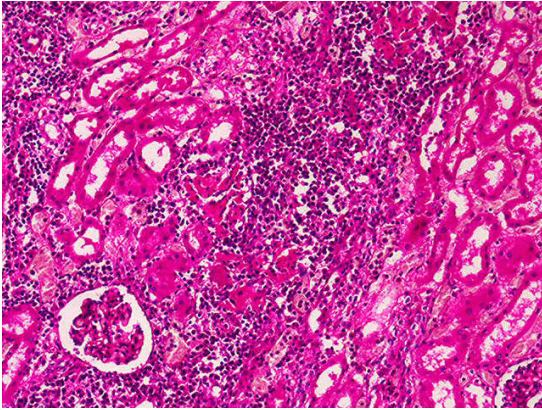


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- Typically, infection by *Actinobacillus* occurs primarily in **neonates**.
- It probably represents an **umbilical infection** and it is acquired either in uterus, during parturition, or shortly after birth.
- **Abscesses**, which sometimes are as much as 3mm in diameter, are found throughout the renal parenchyma.
- These are usually evident grossly and microscopically.
- The most common cause in adult cattle is probably *Corynebacterium pyogenes*.



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The characteristic interstitial inflammatory infiltrate is patchy in the cortex and streak-like in the medulla.



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### Pyelonephritis

- Inflammation of the renal pelvis and renal parenchyma characterized by the formation of a purulent exudate in those areas.
- It usually develops from an ascending infection and is usually accompanied by ureteritis and cystitis.
- The most common pathogens are *E. coli*, *staphylococci*, *streptococci*, *Enterobacter*, *Proteus*, *Pseudomonas*, *Corynebacterium renale*, and *Corynebacterium suis*.
- These bacteria are carried up the urinary tract, retrograde to the flow of urine.



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- It only causes problems when the urine is septic.
- Reverse peristalsis may occur in the ureter when there is a cystitis.
- In the kidney, the medulla is more susceptible to ascending infections.
- This is probably due to its location as it relates to ascending infections, and to other factors including its relatively hypoxic state, hyper-tonicity, and its increased concentrations of ammonia.
- Pyelonephritis is usually bilateral but not necessarily symmetrical.
- Acute pyelonephritis is seen more commonly in sows and chronic pyelonephritis is most often reported in cows and dogs.



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### Hydronephrosis

- It does result in considerable damage to the renal parenchyma.
- It refers to dilatation of the renal pelvis and calyces with progressive atrophy of the renal parenchyma and cystic enlargement of the kidneys.
- It is caused by some form of urinary tract obstruction.
- Obstructing lesions may be complete or partial and they may be congenital or acquired.
- There are many possible acquired causes including urinary calculi, cystitis, prostatic enlargement, compression of the ureters by surrounding inflammatory or neoplastic tissue, displacement of the bladder, and acquired urethral strictures.



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- If the obstruction involves only **one ureter**, the hydronephrosis will be unilateral; however, if **both ureters** are involved, or if the **bladder** or the **urethra** is involved, the hydronephrosis will be bilateral.
- It may not be symmetrical.
- Complete or severe bilateral obstruction usually causes death, due to **uraemia**
- The pathogenesis involves persistence of **glomerular filtration** inspite of urinary tract obstruction.
- If the obstruction persists, the kidney parenchyma will eventually undergo complete **degeneration and necrosis** and will be replaced by fibrous connective tissue, forming a **cystic structure** with a fibrous connective tissue wall.



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### Grossly

- there is progressive dilatation of the **renal calyces** and **pelvis** and **blunting of the papillae** or medullary crests.
- In severe cases, this may progress to form a large unilocular or multilocular **cyst**.

### Histologically

- tubular dilatation is the most striking feature with damage occurring in the proximal regions of the nephron first.
- In severe cases, there is **liquefactive necrosis** in the medulla causing progressive reduction in the medullary parenchyma.



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<http://en.wikipedia.org/wiki/Hydronephrosis#/media/File:Hydronephrosis.jpg>



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