

## **The Urinary System**

Is an excretory system, responsible for removal of waste products from the blood after filtration of the blood from the kidney, and also assist in the regularity of homeostasis of the circulatory system in order to give the tissue in the body to achieve its functions well. The system also release renin and hormone to the blood to regulate the production of Angiotensinogen, responsible for blood pressure and also this system release erythropoietin from the kidney, assist in the formulation of RBS from bone marrow in case of severe bleeding in the body.

The urinary system is formed by:

- 1. Kidney**
- 2. Ureter**
- 3. Urinary bladder**
- 4. Urethra**

The kidney:

Is bean-shape in most animals and human, in the ox it is lobulated, usually formed by the cortex and medulla surrounded by thin capsule from outside. The cortex is containing the glomeruli which are the area of filtration of blood, the structural and functional units of the kidney are called nephrons.

Each nephron is formed by:

- A. Glomerulus surrounded by Bowman s capsule**
- B. Proximal convoluted tubules**
- C. Descending strighted limb of Henle loop**
- D. Thin segment of Henle loop**
- E. Ascending segment of Henle loop**
- F. Distal convoluted tubules**
- G. Collecting tubules**
- H. Collecting ducts**
- I. Papillary duct (Bellini duct)**

The kidney is also two types:

- A. Uni pyramidal**
- B. Multi pyramidal**

**The glomerulus: is the portion of nephron which the filtration of blood is occurred inside it, it is formed by:**

- A. Afferent arteriole (from a tuft of capillaries)**
- B. Efferent arteriole (from a tuft of capillaries)**

**These are surrounded by the Bowman's capsule, so these are called Renal corpuscle.**

**The filtration is usually in the space of Bowman's capsule is pass through the tubules which are:**

- a) Proximal convoluted tubules which is formed by lumen lined by pyramidal cells, and the surface of the epithelial cells containing micro villi to reabsorb essential materials in the filtrate.**
- b) The thick descending straight segment is formed by cuboidal cells.**
- c) Thin segment of Henle loop, is a small lumen (U-shaped) lined by simple squamous cells.**
- d) Thick ascending straight segment of Henle loop, is like of descending thick loop.**
- e) Distal convoluted tubules, are present mostly near the glomeruli and are lined by cuboidal cells without micro villi in the apical surface, these are responsible for reabsorption of the water, glucose, minerals and ions.**
- f) Collecting tubules, these are responsible for conveying the filtrate (urine) toward the medulla, the cells are cuboidal cells.**
- g) Collecting ducts, these are larger in size and consider as excretory ducts, lined by simple columnar epithelium.**
- h) Papillary duct, is the final duct which collect the urine from most of the collecting ducts and release it to the pelvis of the kidney through the papilla of the kidney which have many papillary ducts, the cells which line it is tall cells.**

**The Medulla: is containing the ducts which collect the urine toward the pelvis of the kidney, and blood vessels also present, but there is no renal corpuscles which are present just in cortex, Henle loops are mostly found in the medulla.**

**The pelvis of the kidney: is the first part of ureter which collect the urine toward the ureter and its pelvis, is lined by transitional epithelium (urinary epithelium).**

**The afferent arteriole, before enter to the space of Bowman's capsule the cells of the tunica media of it become approximate to each one and transform into tall cells of smooth muscle cells which the presence of blackish granules in its cytoplasm called macula densa and these are adjacent to the glomerulus and distal convoluted cells of tubule, so the whole system is called juxta glomerulus apparatus, responsible for releasing of renin and angiotensinogen.**

**The Ureter:**

**Is tubular structure responsible for conveying the urine to the urinary bladder, it is formed by:**

**A. Mucosa**

**B. Sub mucosa**

**C. Muscular coat**

**D. Tunica adventitia**

- **The mucosa is containing transitional epithelium resting on B-M, the lamina propria is formed by elastic and collagen fibers with the presence of mucus glands in the horse.**
- **The sub mucosa, also formed by C-T.**
- **The tunica muscularis is formed by inner longitudinal and outer circular smooth muscle fibers.**
- **Adventitia is formed by loose C-T with blood vessels and nerves.**

**The urinary bladder:**

- **Is formed by four layers like the ureter.**
- **The epithelium is transitioned.**
- **The lamina propria is mostly elastic fibers with collagen.**
- **The sub mucosa is mixed with mucosa layer.**

- The muscular layer is formed by interlacing arrangement of smooth muscle fibers, consider thick to face the over distention of urine inside the bladder.
- The tunica adventitia is a loose C-T.

#### **The Urethra:**

**Is the terminal part of the urinary system which consider as communicating between this system and genital system of the male, it is formed by:**

- A. Mucosa (pseudostratified columnar epithelium transform into stratified squamous epithelium at the junction with the skin)**
- B. Sub mucosa (loose C-T, elastic, collagen, smooth muscle fibers)**
- C. Muscular coat (inner longitudinal, outer circular)**
- D. skin**