



## A comparative of histological study between the kidney's rabbits and guinea Pig

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<b>Received:</b> June 17, 2024	<b>Abstract</b> The current study's focus is on the different histological features in kidney between these species. There are six mature, healthy animals for each type, rabbits, separated all of them have been prepared for examination in the animal house at College of Veterinary Medicine, Kerbala University. The animals were euthanized by I.M of diazepam (1 mg/1 kg) with ketamine (20 mg/1 kg). The samples were fixed in (10% ) formalin for 72 hours and dehydrated in alcohols after that, impregnation was done in paraffin. The embedded blocks are cut (7) $\mu$ thick and slices stained with (H &E) stain. The histological features of rabbit kidneys were renal corpuscles in cortex region less in number than renal corpuscles in guinea pig. In addition, the renal corpuscles in guinea pig had highly vascularized by glomeruli. The podocytes in guinea pig dense distribution inside of corpuscles. The Proximal tubule lined with simple cuboidal epithelial cells in both species but different in activity, the proximal tubules are in guinea pig had high brush border and appearance small in lumen, while in rabbit had large lumen. The Loop of Henle was consisted of the thin limbs. It is clear that feeding the histological results in kidneys of guinea pig its more activity than the kidneys in rabbits.
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### Introduction

The wild cavy (*Cavia aperea*), a widespread rodent in South America, is the ancestor of the domestic guinea pig [1]. The structure and operation of the urinary system are studied in a variety of animal species, particularly dogs, cats, pigs, rats, and guinea pigs. Frequently, findings from one species have been applied directly to humans [2]. Continuity and excretion, are the main functions of the lower urinary system, depend strictly on the anatomy of the pelvis, despite the fact that individual anatomical structures can be comparable, but a great considerations for humans must be supposed compared to animals [3]. The kidney is a combined, multifunctional organ that performs numerous essential bodily functions. Similar to other vertebrates, fish kidneys play a crucial role in immunological processes and are the main organs involved in osmoregulation [4,5]. This organ is divided morphologically into two parts, known as the exocrine or trunk kidney and the cephalic or head kidney. In particular species, the morphology and functions are distinct, but there is no discernible separation between



sections [6]. The renal portal system drains the vast network of arteries and capillaries that connect the lymphohematopoietic tissue that makes up the head part [7]. Understanding normal renal dimensions (RD) beforehand may aid in the identification of kidney disorders. Nephropathies cause changes in renal dimensions as a result of either atrophy or hypertrophy processes [8]. Determining the pattern of appropriate renal size is so crucial. Necropsy research have led to the hypothesis that gender influences differences in renal weight and RD, with males generally weighing more. One of the most popular study animals in urinary physiology is the rat. Rats are helpful in evaluating toxicologic insults to the urinary system as well. Since the middle of the nineteenth century, rats have been employed in experiments. For the purpose of researching hereditary illnesses, neurological anatomy, nutritional problems, hypertension, type 2 diabetes, and other topics, multiple types of the strain have been produced. The most common animal model utilized in biological research labs across the globe is the rat. [9]. Mammals have two kidneys, renal pelvises, ureters, bladders, and urethras that make up their urinary systems. Hormones such as erythropoietin and rennin are produced in the kidneys, which also control the body's fluid and electrolyte balance. Erythropoietin is a glycoprotein growth regulator that promotes the synthesis of erythrocytes, and renin helps to regulate the level of blood pressure. [10,11]. The conventional bean-shaped look of unipolar mammals kidneys is present in the kidney of the mammalian family. The exterior cortex, central medulla, and overlying capsule make up the kidney. The inner medulla is slightly thicker and has less blood flow than the outer cortex. The nephron, the structural component of the kidney, is composed of corpuscle, closest obscure tubules, loop of Henle, distal convoluted tubules, and accumulating tubules. The cortex and medulla are composed of distinct tubule structures. Bowman's capsule is made up of two thin cellular layers: the innermost layer, which is called the visceral layer, and the outer layer is called the parietal layer, which is made up of simple squamous epithelium resting on basal lamina. The visceral layer is made up of flattened epithelium [12,13]. This study aimed to give lab animals a fundamental understanding of kidney function in relation to pathological assessments and surgical techniques.

## **Materials and Methods**

### **Samples**

Six mature animals for each species rabbits and guinea pig were used in the current study. All research animals were put to death by intramuscular injections of xylazine&ketamine (20 mg/kg b.w) [14,15].

### **Histological preparing**

The kidney provided the histology specimens. Then, for 72 hours, the components, which were 0.5 cm wide, were immersed in 10% formalin. Along with conventional histology methods, (hematoxylin and eosin) dye was used to distinguish between various tissue components. All sections of tissue, tubules of the kidney, and renal corpuscles have been considered in the histological evaluations. The histological



characteristics were investigated using a digital USB microscope camera (Canon 500 D, 16 Megapixel, Japan) installed on a Novel microscope. A stage micrometer has been used to synchronize the objective lenses with the software [15].

## **Results and Discussion**

### **Kidney of rabbits**

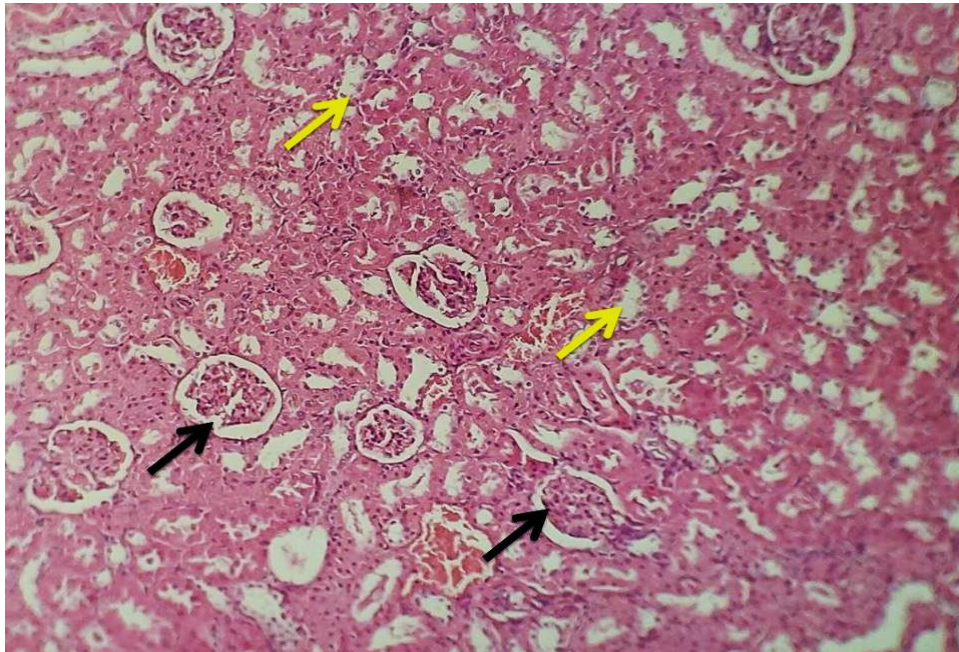
The kidneys in rabbits were covered by a delicate fibrous capsule with adipose tissue. The histological section in current study in rabbit kidneys finding renal corpuscle were spherical in shaped, the nephron had tubular system consisting of proximal convoluted and straight tubules and distal tubules connected between them thin tubules called Henle loop. These finding agree with [16] who stated that the kidney in all domestic and lab animals had developed of nephron that composed of glomerulus and proximal with distal tubules. Meanwhile, the renal corpuscles of rabbits are made up of two layers of Bowman's capsule that are surrounded by a tuft of fenestrated capillaries known as glomeruli. Numerous podocytes that are employed for blood filtration are dispersed between these tufts. The vast majority of the renal tubules descend into the renal medulla, whereas the majority of the renal corpuscle formations make up the biggest portion of the renal cortex (Fig.1,2).

The kidneys in rabbits had proximal tubules some of these tubules adhering to corpuscles to receive filtrated fluid that rich by ions, while there are tubules away from corpuscles called distal tubules. The juxtaglomerular system in rabbits consist of two layers of cells and smooth muscle fibers this finding akin with [17] who mention that the numerous of cells located adjacent to corpuscles act a contraction of this area and release of renin (Fig.3).

### **Kidney of Guinea pig**

The kidneys in guinea pig were covered by thin fibrous capsule. The histological examination in this investigation in rabbit kidneys showed the renal corpuscles were oval in shaped, the numbers of renal corpuscles in guinea pig more than in rabbits, and the large amount of connective tissue separated of each other (Fig,4). These results disagreement with [18] who finding the renal corpuscle in guinea pig was aglobe-shaped. The renal corpuscles in guinea pig consist of two layers of Bowman's capsule which same as corpuscles in rabbits but, in guinea pig the Bowman's space its large and the tuft of capillaries its crowded. In addition the podocytes in guinea pig spread as densely (Fig, 5). These results lead to the kidney in guinea pig more actively this unlike with [19] that finding the renal corpuscles in rodents similarity with rabbits. The kidneys in guinea pig had filtration system very well than rabbits, in current study observed the proximal tubules lined by simple cuboidal epithelia with high brush border and the lumen its smaller than rabbits and the cytoplasm cells in guinea pig its dark and more acidity this result due to the filtration processes in guinea pig that more activity (Fig,6). These result akin with [20] who stated that Through a sophisticated network of cellular protrusions, the highly differentiated epithelial cells known as podocytes

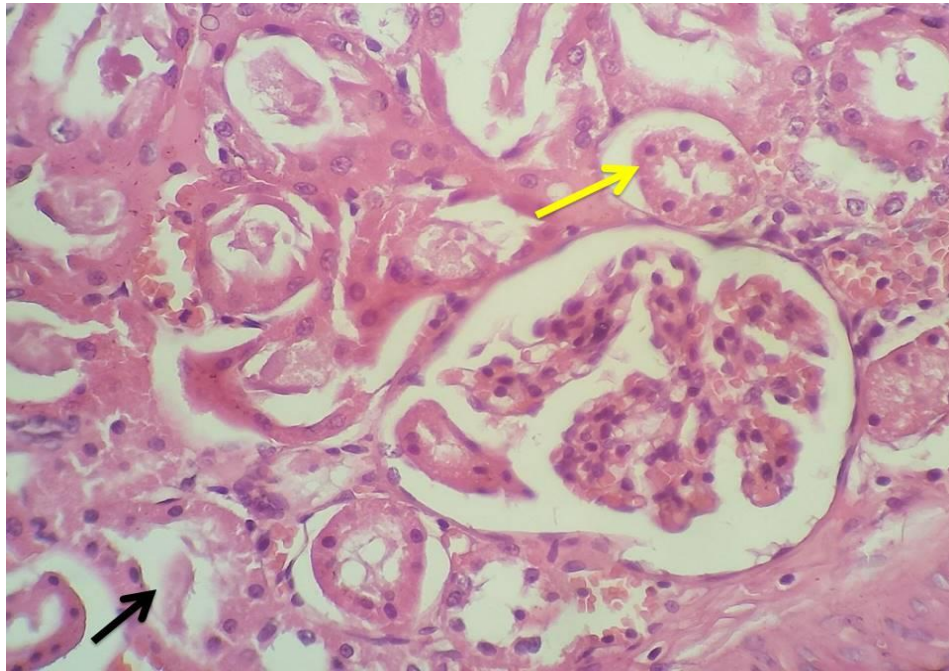
construct the kidney filtration barrier's outer layer and enable it to endure strong mechanical stresses.



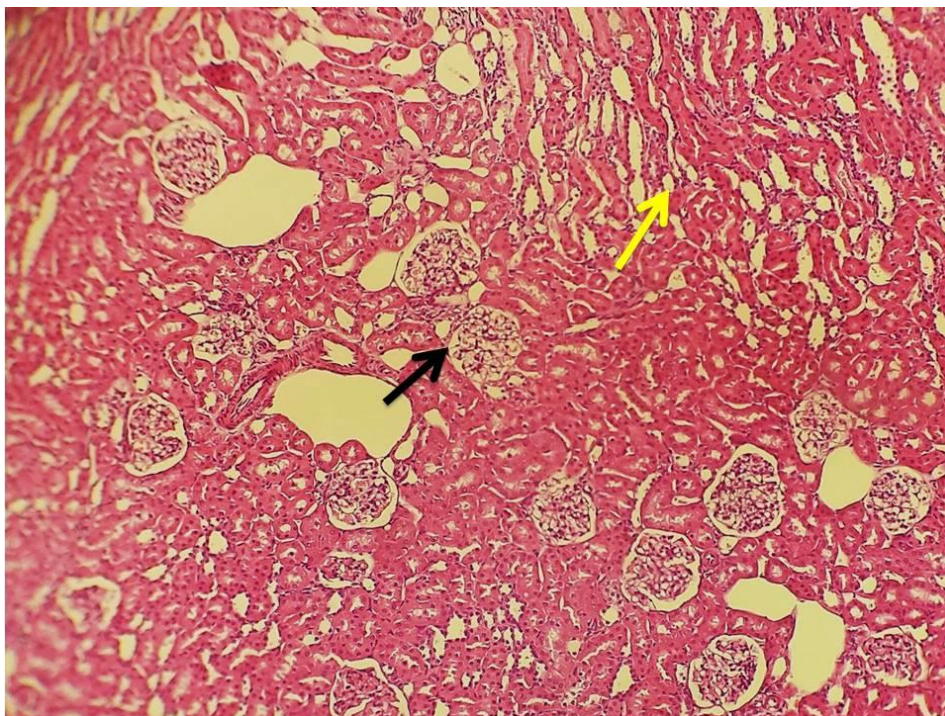
**Figure (1):** Photomicrograph of kidney in rabbits showing distribution of glomerulus (black arrows) and renal tubules (yellow arrows). H&E stain 10x



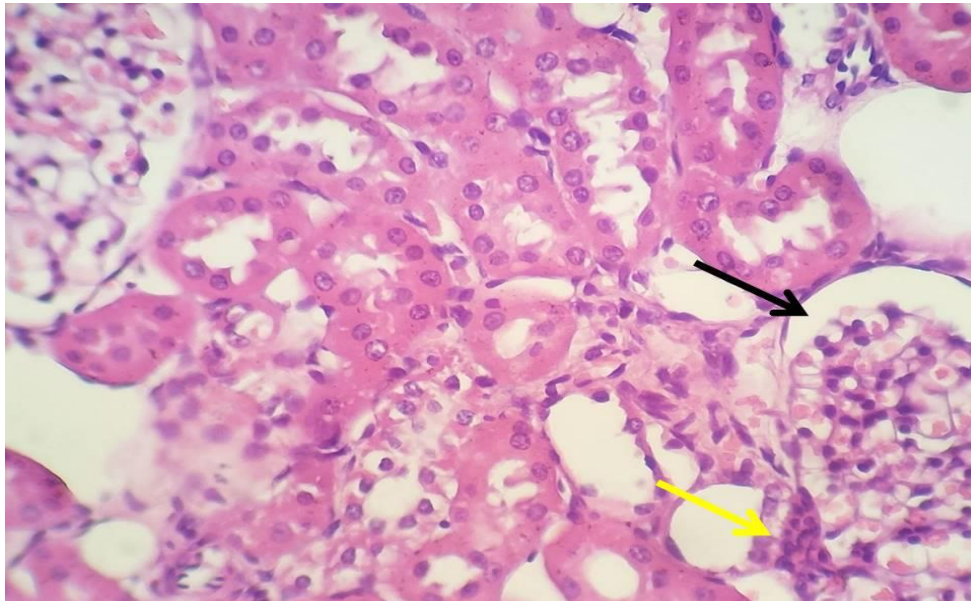
**Figure (2):** Photomicrograph of kidney in rabbits showing glomerulus with Bowman capsule space (black arrow) and juxtaglomeruli (yellow arrow). H&E stain 40x.



**Figure (3):** Photomicrograph of rabbits showing the proximal tubules had short brush border with wide of lumen (black arrow), the distal tubules (black arrow). H&E stain 40x.



**Figure (4):** Photomicrograph of kidney in guinea pig showing the density of mesangial distribution of renal corpuscles (black arrow) and renal tubules (yellow arrows). H&E stain 10x.



**Figure (5):** Photomicrograph of kidney in guinea pig showing the hypertrophy in glomerulus with density of tufts glomeruli & large Bowman's space (black arrow) and juxtaglomeruli (yellow arrow). H&E stain 40x.



**Figure (6):** Photomicrograph of guinea pig showing the proximal tubules (yellow arrow). The proximal tubules had short brush border with wide of lumen, the distal tubules (black arrow) (black arrows). H&E stain 40x.



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