Renal Corpuscle

The renal corpuscle, located in the cortex, is the first site of filtration in the nephron. Here, arterioles bring blood from the body into the kidney for filtration. The glomerulus is a cluster of capillaries derived from those arterioles that feed into the nephron. Some important parts of the glomerulus include fenestrations, basement membrane, and podocytes. Through selective filtration, the glomerulus filters the blood and allows plasma solutes and large proteins to be secreted as ultrafiltrate. However, red blood cells cannot be filtered and are maintained in the blood. Smaller molecules enter the nephron to be reabsorbed or secreted, depending on physiological conditions. Encapsulating the glomerulus is Bowman's capsule, which is the location of ultrafiltration. From here, filtrate enters the nephron.



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LOCATION

Cortex
Kidney Cortez
The renal corpuscles (glomeruli + Bowman’s capsules) are found exclusively in the renal cortex, forming part of the cortical nephron. Juxtamedullary nephrons, located near the corticomedullary junction, also contain corpuscles in the cortex, with loops of Henle extending deep into the medulla.

Characteristics

Arterioles
Artery-O's
Afferent arterioles bring blood from the renal artery into the glomerulus of the kidney, where filtration begins, these afferent arterioles are able to dilate to allow for more filtration.

Glomerulus
Glow-mare
The glomerulus is a tuft of fenestrated capillaries lined by endothelial cells. Filtration occurs across three main layers:
1. Fenestrated endothelium – restricts the passage of blood cells.
2. Glomerular basement membrane (GBM) – composed of type IV collagen and heparan sulfate, provides both size and negative charge selectivity.
3. Podocyte filtration slits – formed by foot processes and slit diaphragms containing nephrin and podocin, which further regulate filtration.
Damage to any of these layers results in proteinuria or hematuria, depending on the defect.

Capillaries
Caterpillar
The glomerular capillaries are supplied by the afferent arteriole and drained by the efferent arteriole, a unique arrangement that allows for high glomerular pressure to drive filtration. Efferent arterioles of cortical nephrons lead to peritubular capillaries, while those of juxtamedullary nephrons form the vasa recta, maintaining the medullary osmotic gradient.

Selective Filtration
Selective Filter
Filtration across the glomerular barrier depends on size, charge, and shape.
Permitted: Water, glucose, amino acids, electrolytes, urea, and small solutes.
Restricted: Albumin and other plasma proteins (due to negative charge and size) and all blood cells.
Filtration pressure is determined by the Starling forces (glomerular capillary hydrostatic pressure, Bowman space pressure, and oncotic pressure).

Plasma Solutes and Other Small Molecules Become Ultrafiltrate
Plasma-TV, Glucose-glue, A-mean-ol'-lemon and ions secreted into Ultra-filtrate bucket
Glucose, amino acids, salts, and urea are pushed by high pressure into the filtrate that enters the nephron. This process is called ultrafiltration.

Bowman's Capsule Encapsulates Glomerulus
Bow-man Encapsulating Glow-mare
Bowman’s capsule surrounds the glomerulus and collects the filtrate in Bowman’s space, located between the visceral (podocytes) and parietal (simple squamous epithelium) layers. This is where ultrafiltrate first enters the nephron. At the vascular pole, the afferent and efferent arterioles enter and exit, while

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at the urinary pole, the filtrate drains into the proximal convoluted tubule.

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