7.1.3

The Nephron: Functional Unit of the Kidney

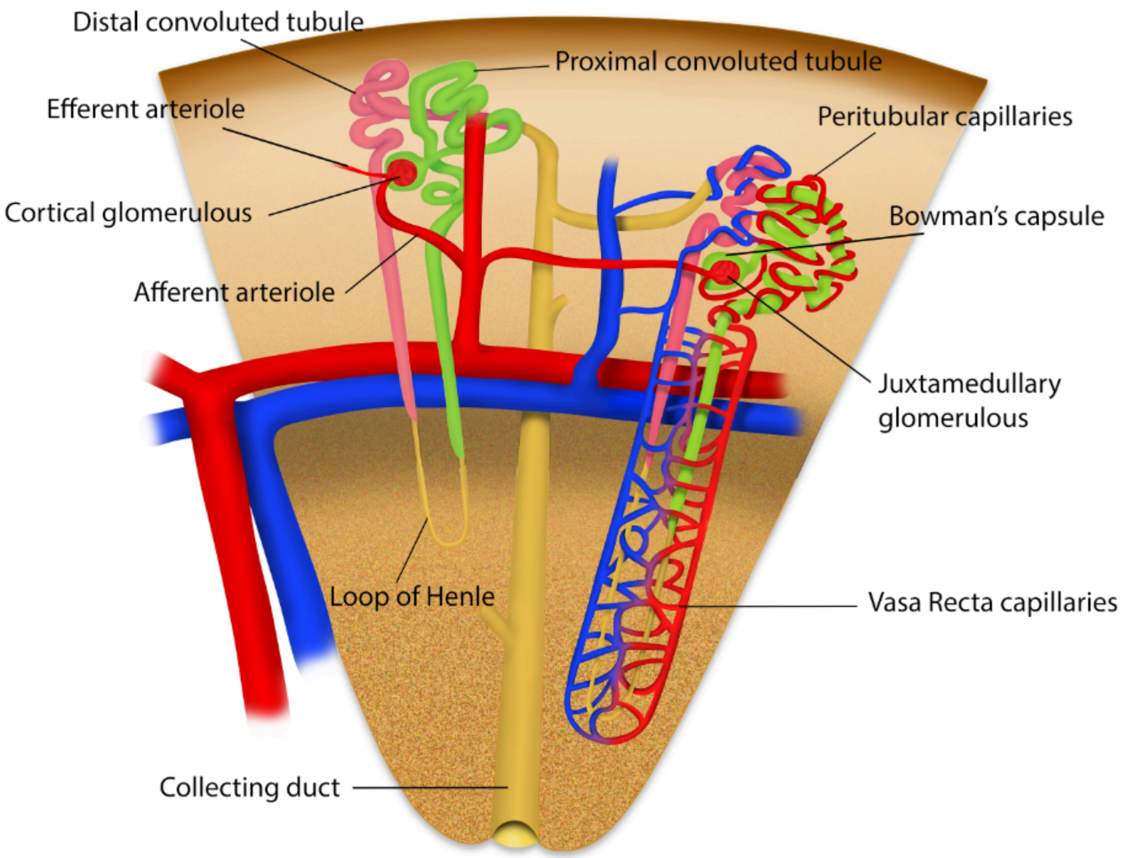

Image by Becky Torgerson S18

Each kidney contains approximately 1.2 million nephrons, which are a series of hollow tubes composed of a single cell layer, either simple squamous or simple cuboidal. The first tube that we entered was the **collecting duct** and serves as a common emptying site for many nephrons. Continuing through the collecting duct, we eventually come to another tube called the **distal convoluted tubule,** a twisting, bending tube (hence the name convoluted) that will take us to a hairpin-shaped tube called the **loop of Henle.** The loop has an **ascending limb** and a **descending limb.** Our path will take us first through the ascending limb, around the 180 degree turn at the bottom, and then up through the descending limb, eventually leading to the **proximal convoluted tubule** (another twisting, bending tube). Passing through the proximal convoluted tubule we finally reach the end of our trip at a structure called **Bowman's capsule.** Bowman's capsule surrounds a special capillary network known as the **glomerulus.** Bowman's capsule and the glomerulus form the **renal corpuscle** which is the initial site of urine formation. Each nephron has one renal corpuscle, thus, there are approximately 1.2 million renal corpuscles per kidney. Collectively, the kidney is nothing more than a series of tubes.

For protection and stability, the tubes are encased in a connective tissue matrix. The connective tissue can be divided into three sections: an outer covering called the **fibrous capsule** (surrounds the entire kidney structure), a superficial layer called the **cortex,** and an inner layer called the **medulla.** The renal corpuscles, proximal convoluted tubules and distal convoluted tubules of each nephron are located in the cortex while the remaining tube structures of the nephrons are located in the medulla. Based on this arrangement, there are two types of nephrons: a cortical nephron and a juxtamedullary nephron. **Cortical nephrons** are named because most of their structures are located within the cortex with their loops of Henle entering only the upper regions of the medulla. These types of nephrons compose approximately 90% of human kidneys. **Juxtamedullary nephrons** are named because their loops of Henle dip all the way down to the bottom portions of the medulla. These juxtamedullary nephrons, as they extend deeper into the medulla of the kidney, undergo a greater pressure which creates the conditions necessary for water reabsorption and comprise approximately 10-15% of the nephrons in the human kidneys. Without the reabsorption of water that returns water back to the bloodstream that happens in the juxtamedullary nephrons we would have a great deal more urinary output as well as the greater potential for becoming dehydrated.