

Collecting Duct

The collecting duct system is a set of tubules and ducts that lead from the nephron to the ureter for urine excretion. One function of the collecting ducts is the absorption of sodium using active transport, specifically sodium-potassium ATPase pumps. At the expense of ATP, sodium is pumped back in the principal cells of the collecting duct and potassium is pumped out. This process is regulated by aldosterone, which stimulates the synthesis of more pumps. Vasopressin also acts on these cells, increasing the water reabsorption by upregulating aquaporin channels, allowing osmosis to occur coupled with sodium reabsorption. Finally, the collecting duct concentrates urine by reabsorbing necessary salts and water, reducing the volume, and increasing the concentration of urine output.



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Characteristics

Na⁺ Reabsorption

Aldo-stereo throwing out Salt-shaker

Aldosterone causes an upregulation in the Na/K ATPase in the principal cells of the collecting duct. This pumps Na out of the cell towards the bloodstream, and K into the cell. The exit of Na creates a gradient that draws Na from within the collecting duct lumen into the cell, and then into the bloodstream. Epithelial sodium channels (ENaC) on the luminal surface allow this movement of Na from the lumen down the gradient into the cell. The movement of these cations use the direct energy of ATP. Aldosterone upregulates ENaC production as well.

Vasopressin Causes Water reabsorption

Vase-presents pressing Water onto Sponge

Vasopressin, also called ADH, or antidiuretic hormone, affects the expression of aquaporin channels on the surface of principal cells, which control the amount of water reabsorbed osmotically.

Concentrates Filtrate

Concentrated-drop dripping into Filter-jar

The collecting duct helps concentrate urine by reabsorbing important electrolytes and water, thus concentrating the urine as it goes to the ureter.