

A night cityscape with blurred lights and a central text overlay. The background shows a street with cars and buildings, with lights creating a bokeh effect. The text is centered in a dark rectangular box.

اللَّهُمَّ لَا تَجْعَلِ الدُّنْيَا أَكْبَرَ هَمِّنَا

*O Allah, do not make this world
our greatest concern.*

[the-introverted-niqabi.tumblr](https://www.tumblr.com/the-introverted-niqabi)

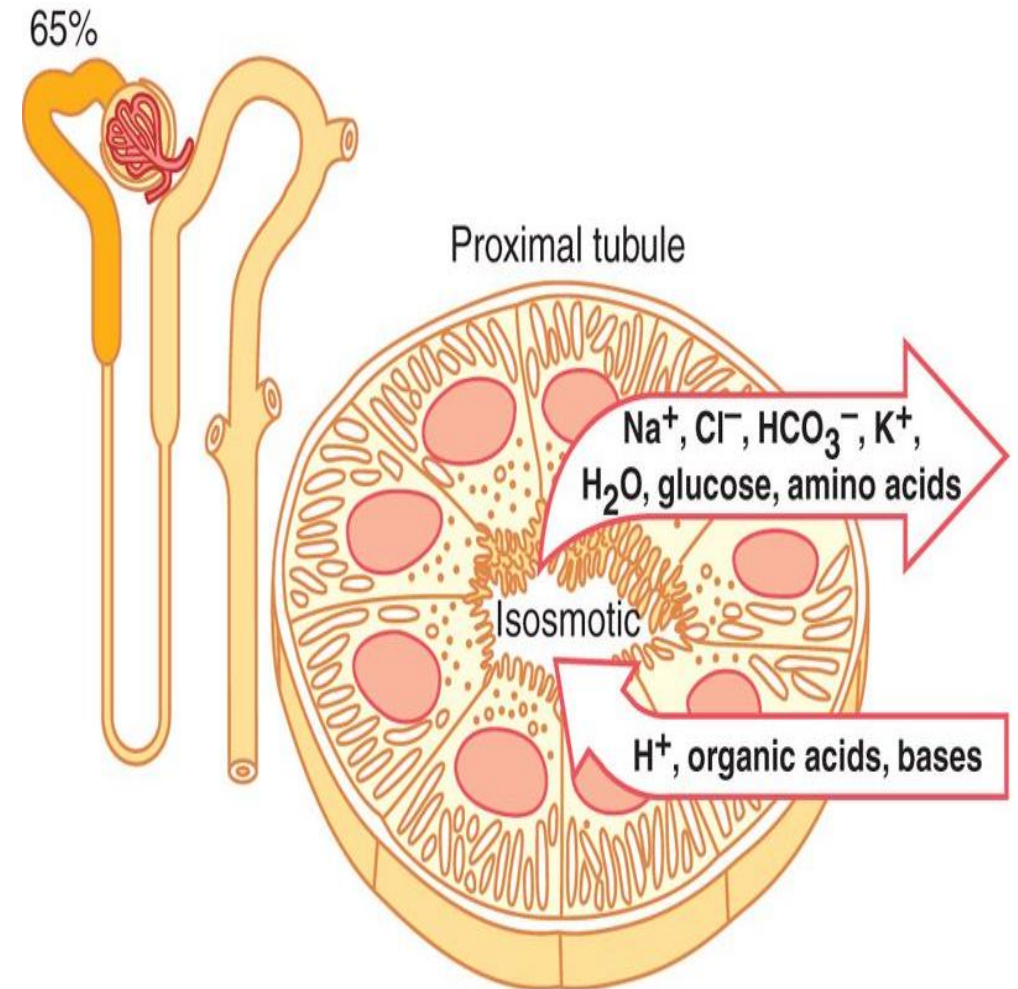


REABSORPTION AND SECRETION ALONG DIFFERENT PARTS OF THE NEPHRON

**Dr Sarah Shahid
Assistant Professor
Physiology Department
KGMC**

PROXIMAL TUBULE

- 65% of all reabsorption & secretion
- Extensive brush boarder
- Lots of mitochondria & loaded with protein carriers.
- Reabsorption occurs constantly regardless of hydration state.



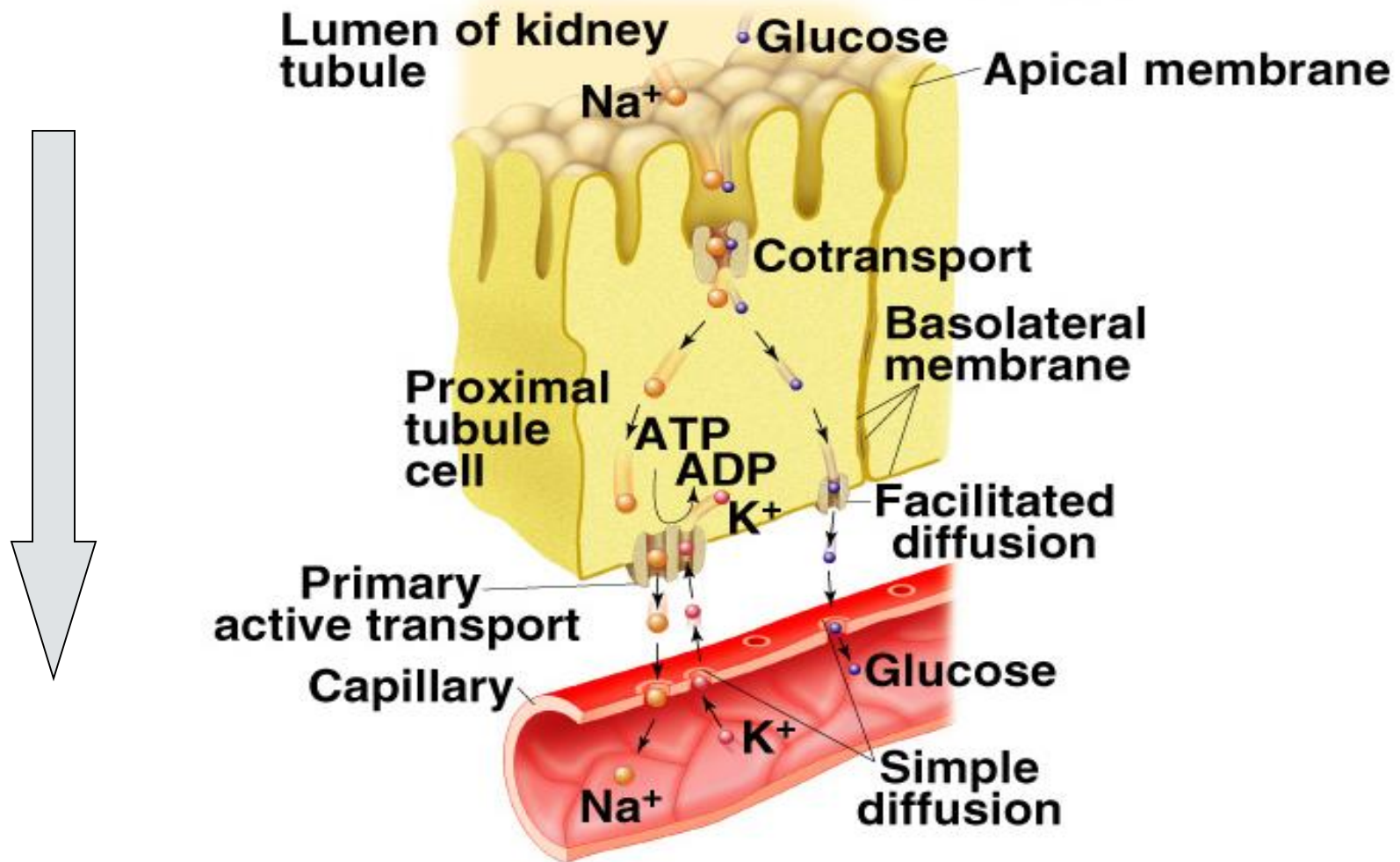
REABSORPTION OF SALT AND H₂O


Return of most of the molecules and H₂O from the urine filtrate back into the peritubular capillaries.

- About 180 L/day of ultrafiltrate produced; however, only 1–2 L of urine excreted/24 hours.
- Urine volume varies according to the needs of the body.

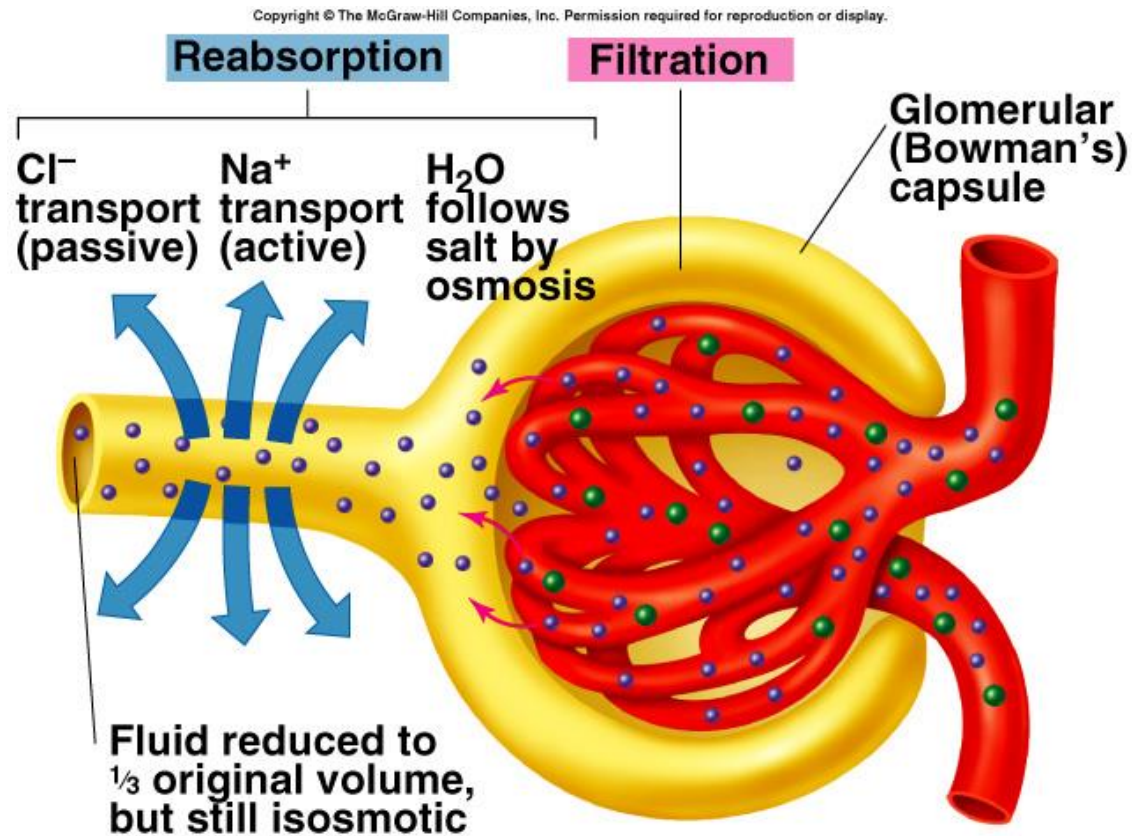
Minimum of 400 ml/day urine necessary to excrete metabolic wastes (obligatory water loss).


REABSORPTION IN PROXIMAL TUBULE



- 
1. Na reabsorbed by Na/K pump
 2. Glucose and AA's by secondary active transport
 3. Cl^- follows Na^+ passively
 4. Water osmotically follows Na^+

SALT AND WATER REABSORPTION IN PROXIMAL TUBULE

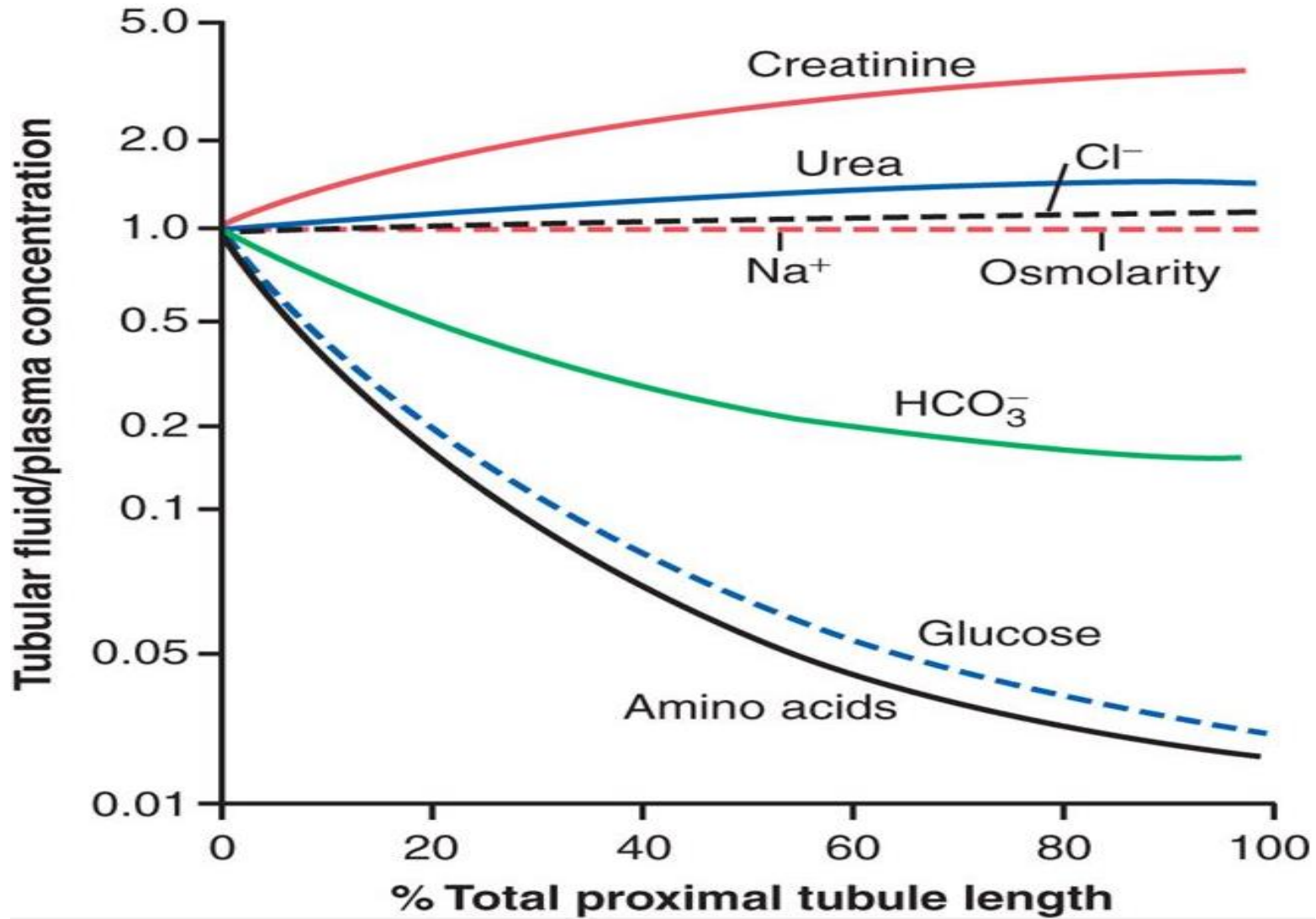




Counter-transport mechanisms that reabsorb sodium while secreting other substances into the tubular lumen, especially hydrogen ions.

Secretion of hydrogen ions into the tubular lumen is an important step in the removal of bicarbonate ions.

CONCENTRATIONS OF SOLUTES ALONG THE PROXIMAL TUBULE

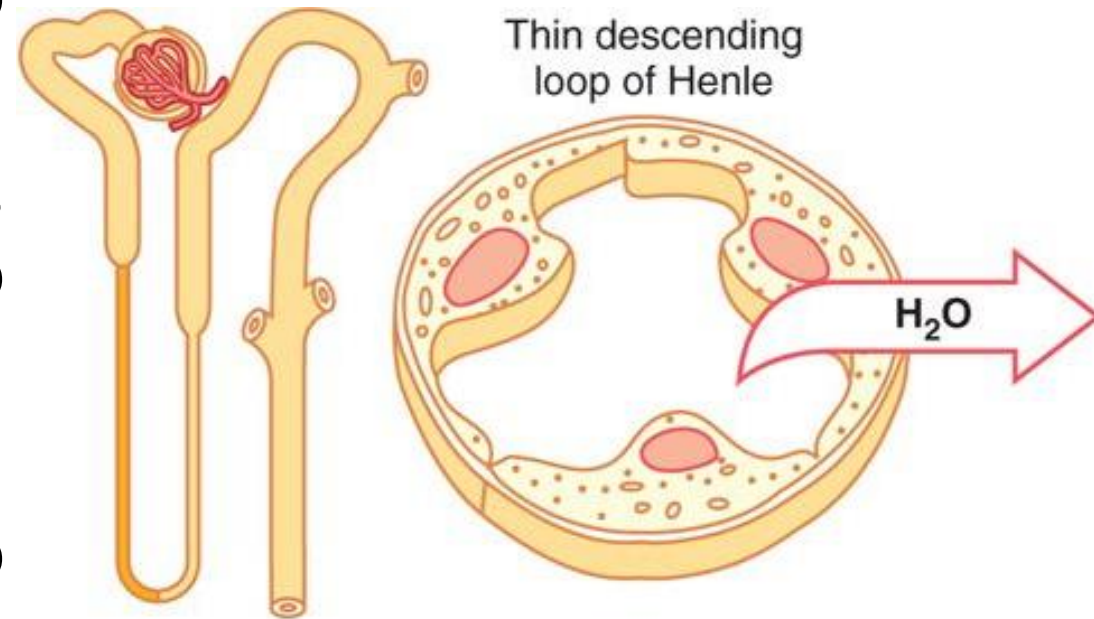


SECRETION OF ORGANIC ACIDS AND BASES BY THE PROXIMAL TUBULE

- The proximal tubule is also an important site for secretion of organic acids and bases such as *bile salts*, *oxalate*, *urate*, and *catecholamines*.
- *Secretion plus filtration* and lack of reabsorption by the tubules, all combined, contribute to rapid excretion in the urine.
- Average person can clear about 90 percent of the para-aminohippuric acid (PAH)
- For this reason, the rate of PAH clearance can be used to estimate the glomerular filtration rate (GFR)

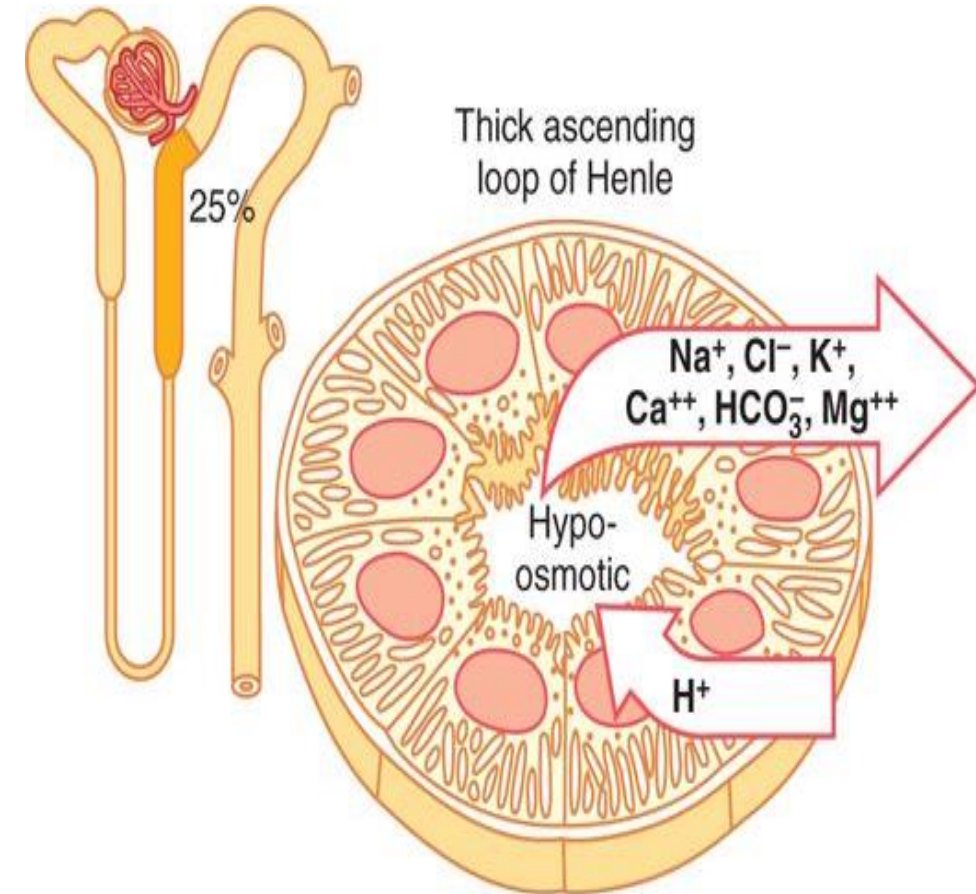
SOLUTE AND WATER TRANSPORT IN THE LOOP OF HENLE

- Descending & ascending thin
- Thin epithelial membranes with no brush borders.
- Few mitochondria, minimal levels of metabolic activity and little or no active reabsorption.
- The descending part of the thin segment is highly permeable to water and moderately permeable to most solutes, including urea and sodium.



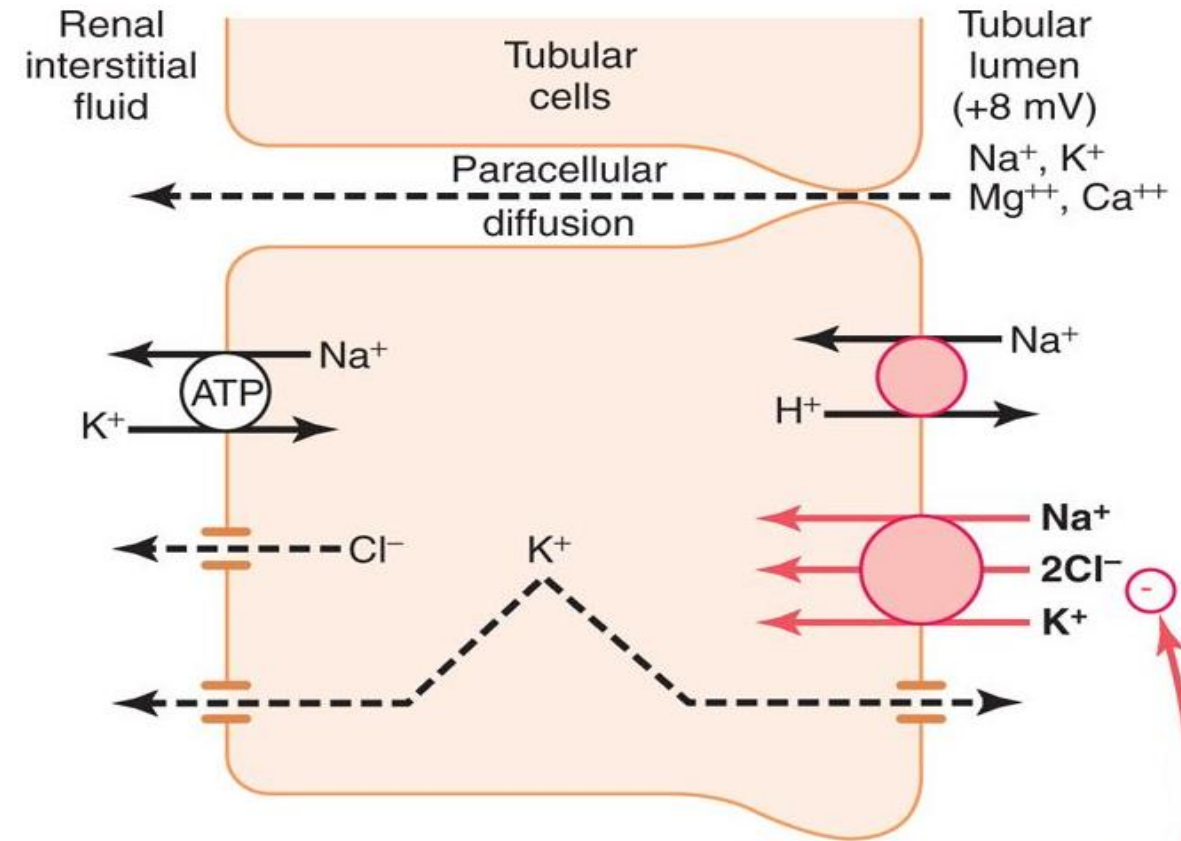
THICK ASCENDING LOOP OF HENLE

- High metabolic activity
- Impermeable to water
- The thick ascending limb reabsorbs about 25 % of the filtered loads of Na^+ , Cl^- & K^+ , as well as large amounts of Ca^{++} , HCO_3^- , and Mg^{++}
- Secretes hydrogen ions into the tubular lumen.



MECHANISMS OF Na^+ , Cl^- & K^+ TRANSPORT IN THE THICK ASCENDING LOOP OF HENLE

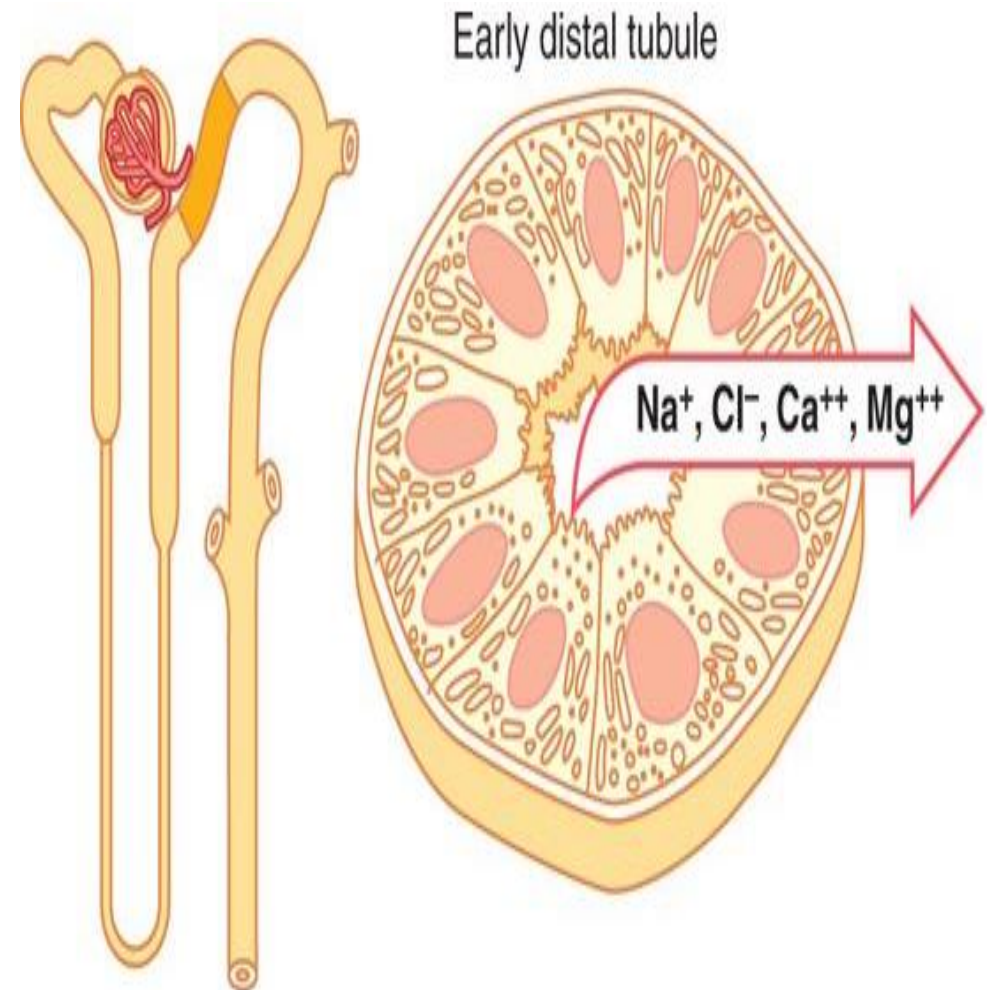
- Na^+ , K^+ ATPase pump in the basolateral cell membrane
- 1-sodium, 2-chloride, 1-potassium co-transporter in the luminal membrane
- Sodium-hydrogen counter-transport mechanism in its luminal cell membrane
- Paracellular reabsorption of cations, such as Mg^{++} , Ca^{++} , Na^+ ,



- Loop diuretics**
- Furosemide
 - Ethacrynic acid
 - Bumetanide

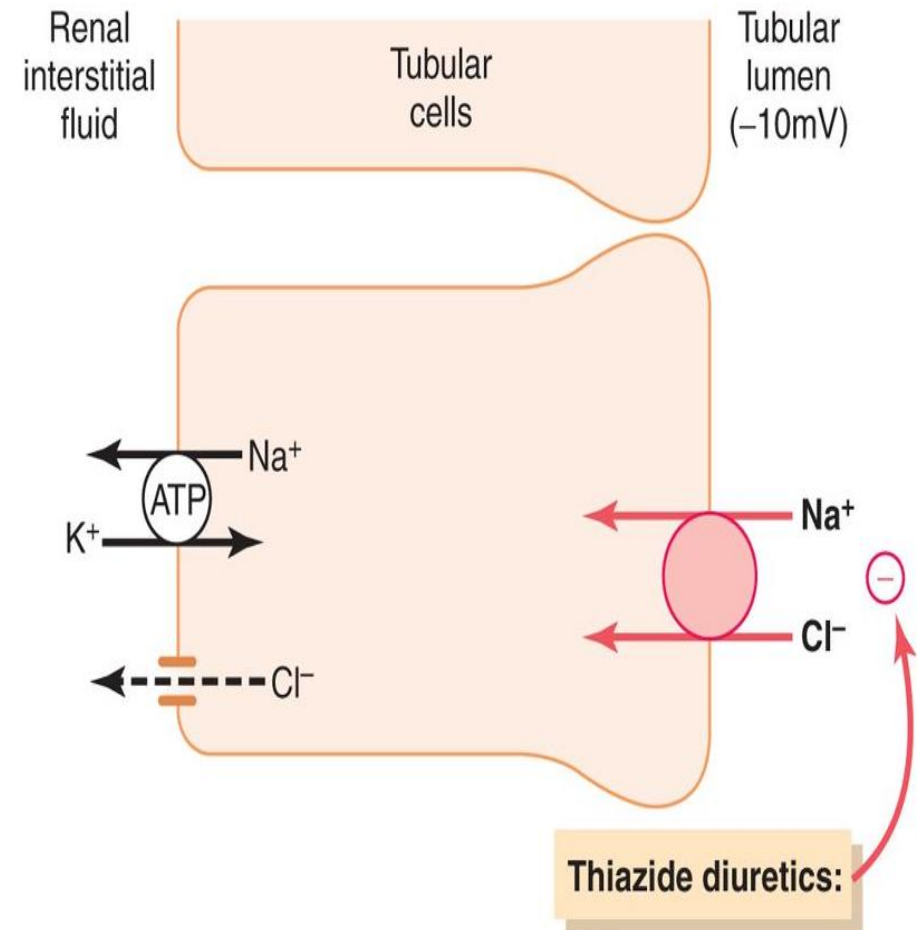
EARLY DISTAL TUBULE

- First portion of the distal tubule forms the *macula densa*
- A group of closely packed epithelial cells that is part of the *juxtaglomerular complex*
- Feedback control of GFR and blood flow
- 5 % of the filtered load of sodium chloride is reabsorbed



MECHANISM OF Na^+ , Cl^- TRANSPORT IN THE EARLY DISTAL TUBULE

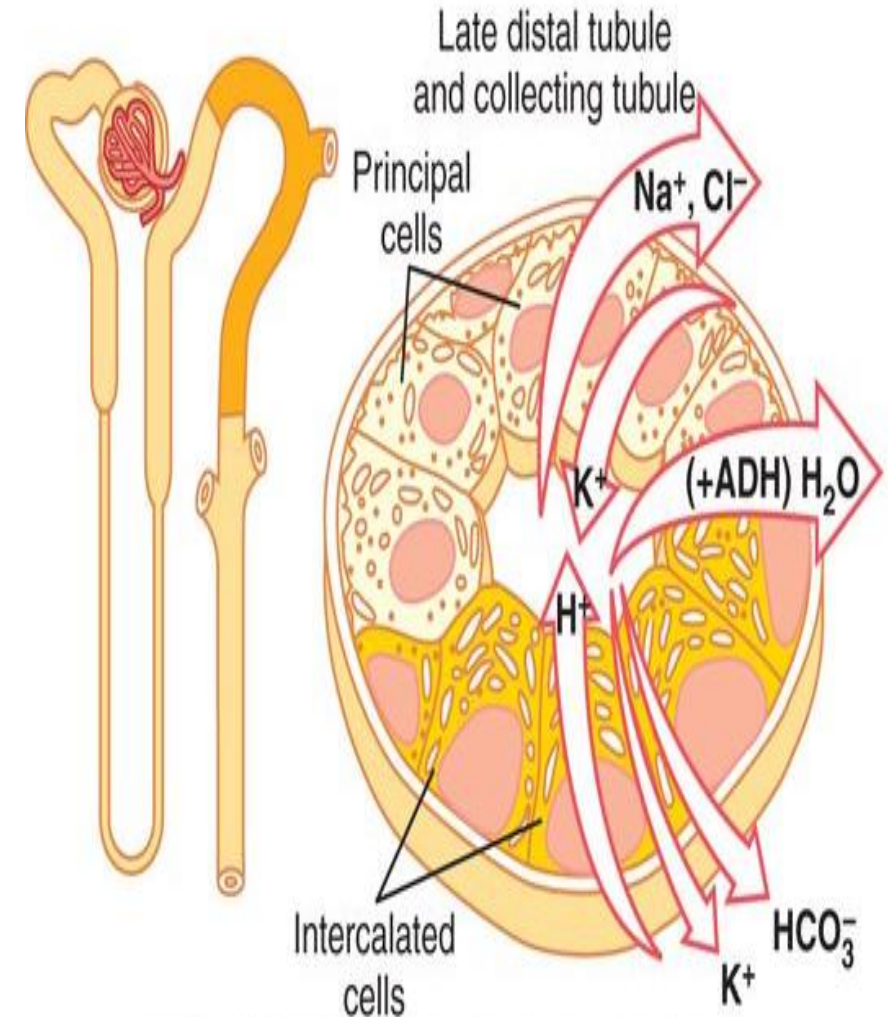
- Na^+ & Cl^- are transported from the tubular lumen into the cell by a co-transporter
- Sodium is pumped out of the cell by Na^+ , K^+ ATPase
- Cl^- diffuses into the interstitial fluid via chloride channels.
- Site of action of Thiazide diuretics



LATE DISTAL TUBULE

Late Distal Tubule & Cortical Collecting Tubule

- Principal & intercalated cells
- Principal cells reabsorb Na^+ & H_2O and secrete K^+ ions
- Intercalated cells reabsorb K^+ & HCO_3^- ions and secrete H^+ ions
- Impermeable to urea
- Na^+ reabsorbed under control of aldosterone
- H^+ secreted for acid-base balance
- Water permeability controlled by ADH

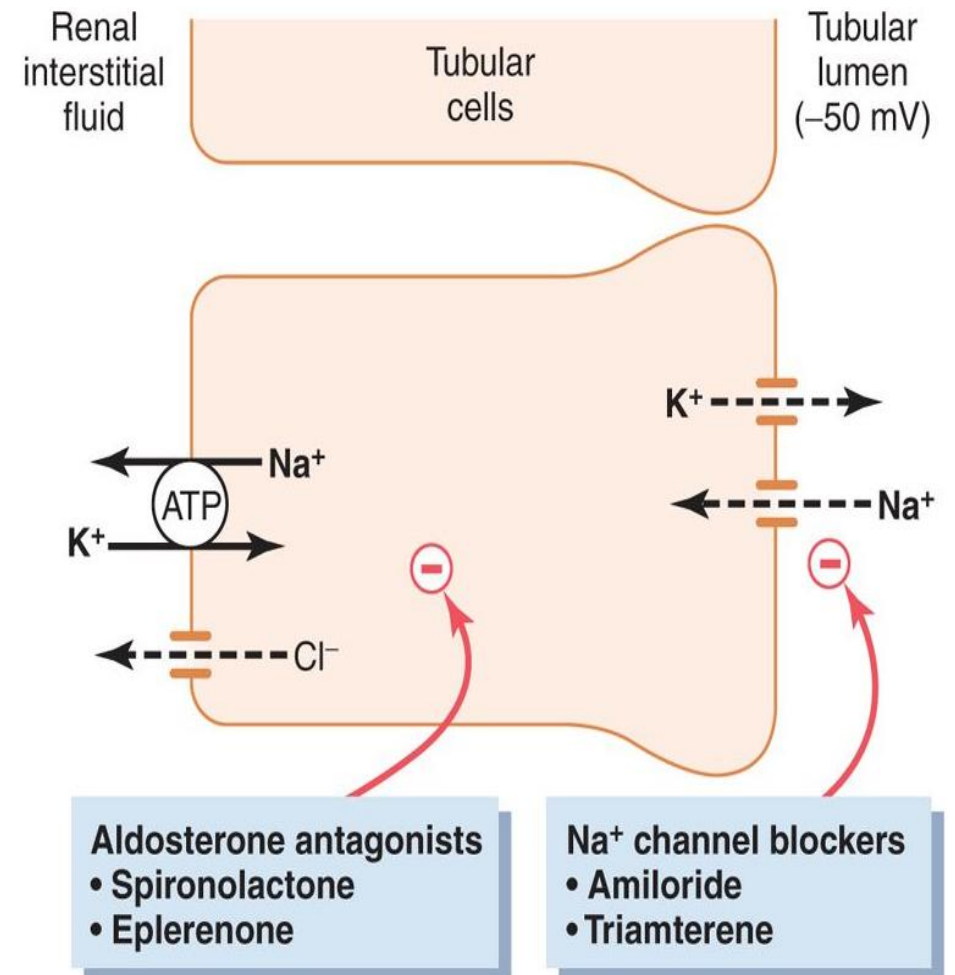


REABSORPTION & SECRETION IN LATE DISTAL TUBULE & CORTICAL COLLECTING TUBULE

➤ Sodium enters the cell through special channels and is transported out of the cell by the Na^+ , K^+ ATPase pump.

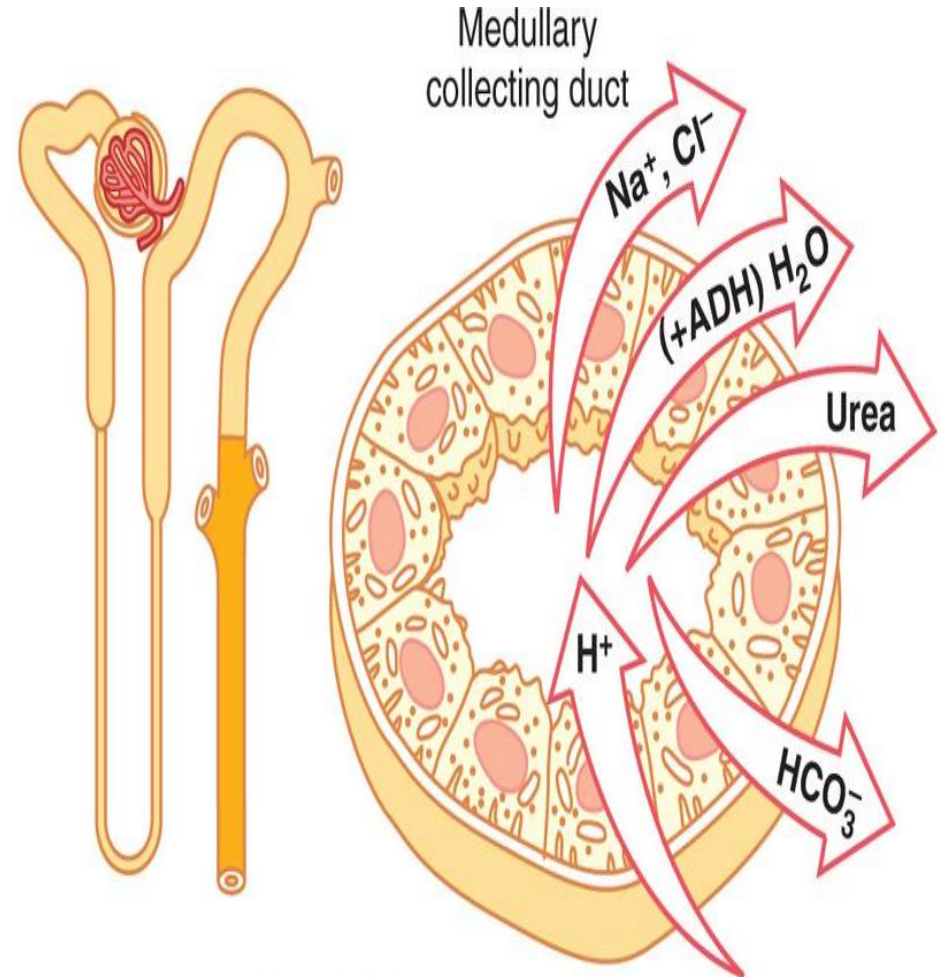
➤ Aldosterone antagonists compete with aldosterone for binding sites in the cell and therefore inhibit the effects of aldosterone

➤ Sodium channel blockers directly

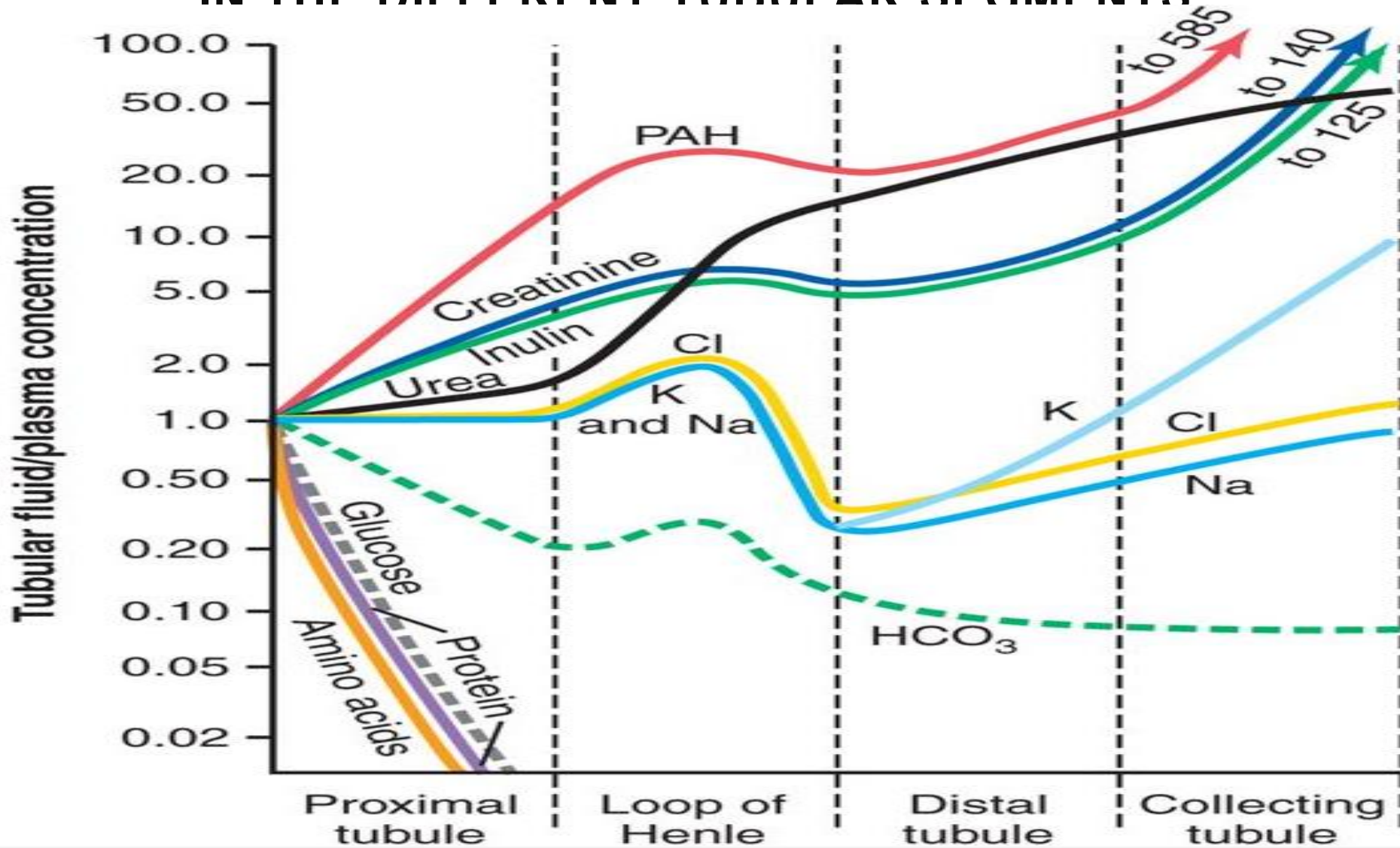


MEDULLARY COLLECTING DUCT

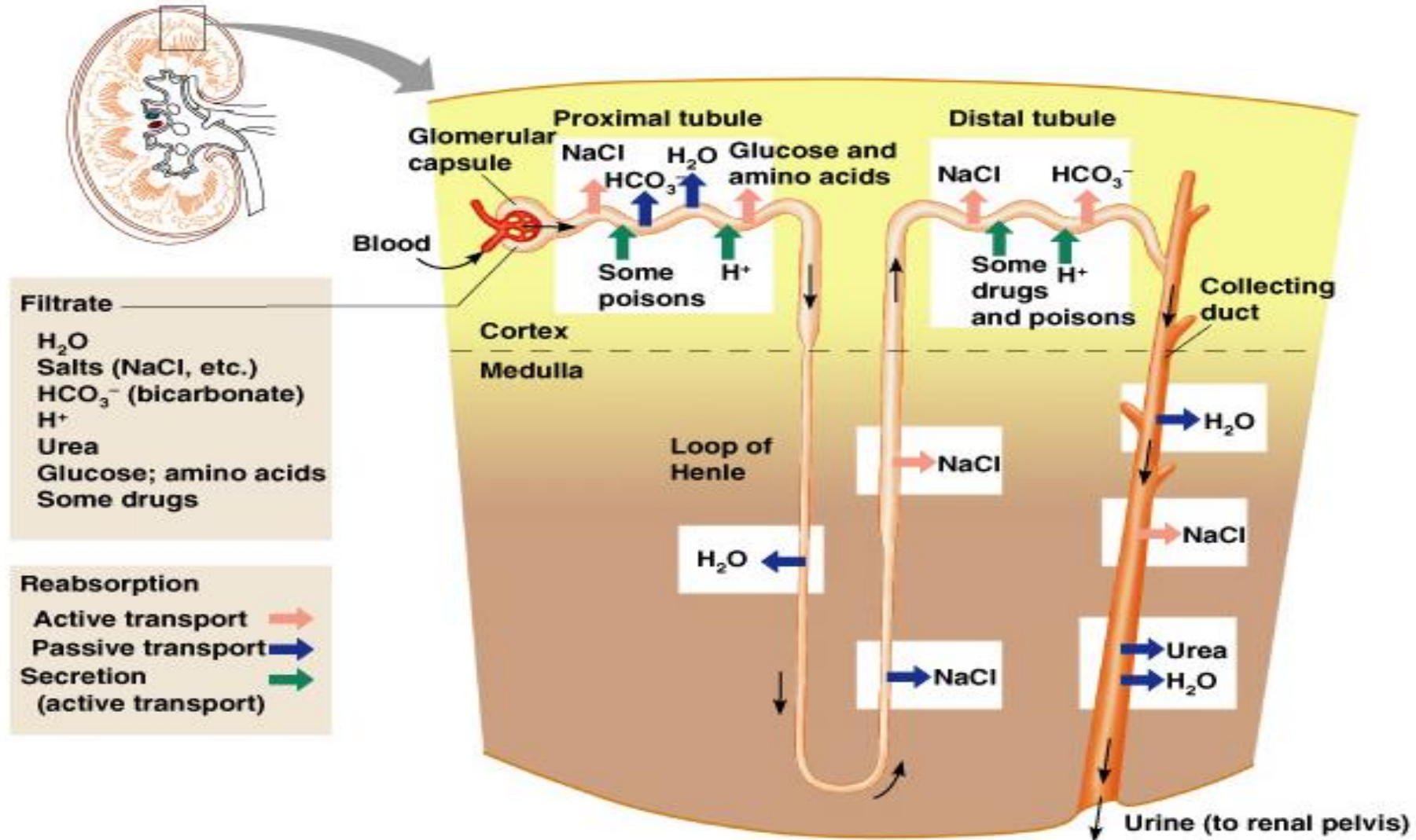
- Reabsorb less than 10 % of the filtered H_2O & Na^+
- Secrete H^+ ions and are permeable to urea
- Final site for processing the urine
- Water permeability

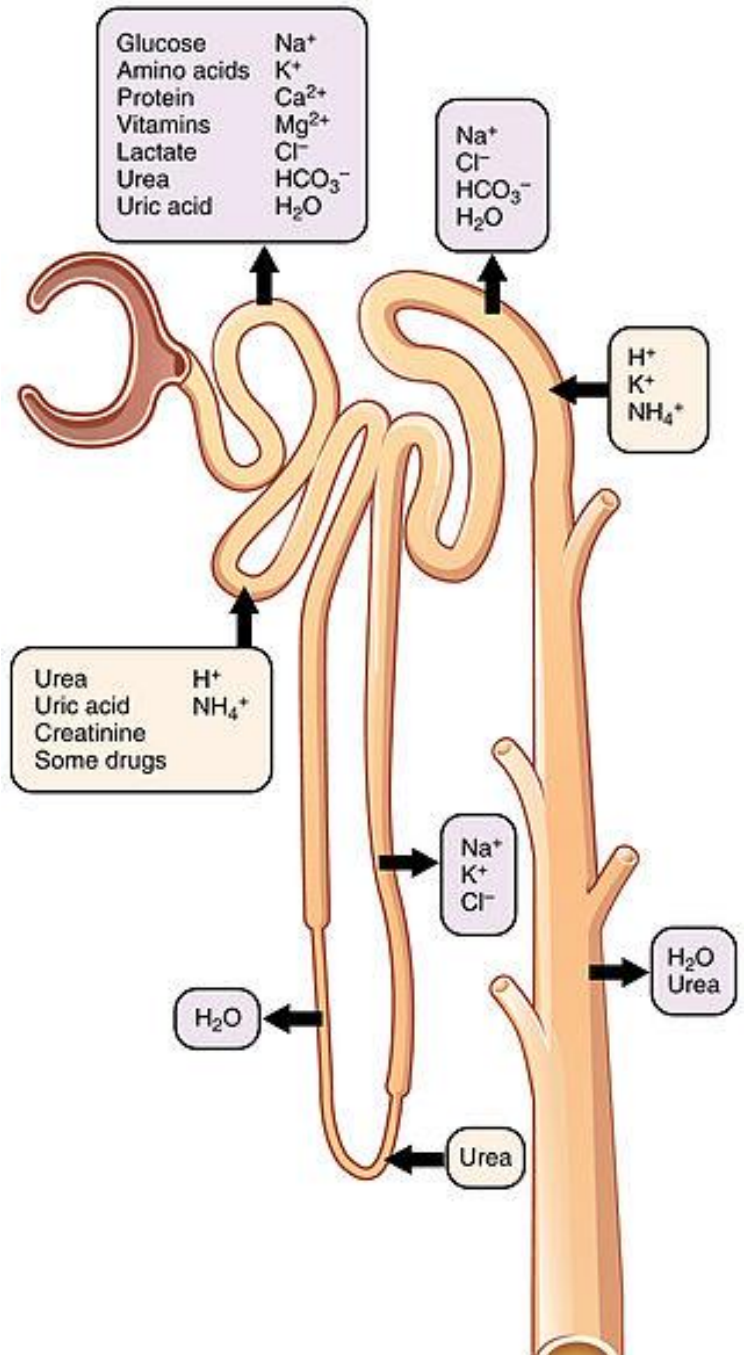


DEGREE OF CONCENTRATION OF SEVERAL SUBSTANCES IN THE DIFFERENT TUBULAR SEGMENTS



FORMATION OF URINE







Things she didn't explain during the lessons

Teacher

Test



She
needed a
hero,
so that's
what she
became.

Questions,
Comments,
Feedback...?

RECOMMENDED BOOKS & LINKS

Guyton & Hall
Sherwood
Sembalingum

https://www.youtube.com/watch?v=rwZIT_N75Bs

<https://www.youtube.com/watch?v=vD1n3-Z6Ec8>



That's all Folks!