Overviews of renal system

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Function

- Regulation of water and electrolytes
- Acid base balance

urine formation

- Filtration:
- It is directly proportional to renal blood pressure and renal blood flow. Water and solutes is filtered across glomerular capillaries

- Reabsorption:
- Is the removal of water and solutes from the renal filtrate
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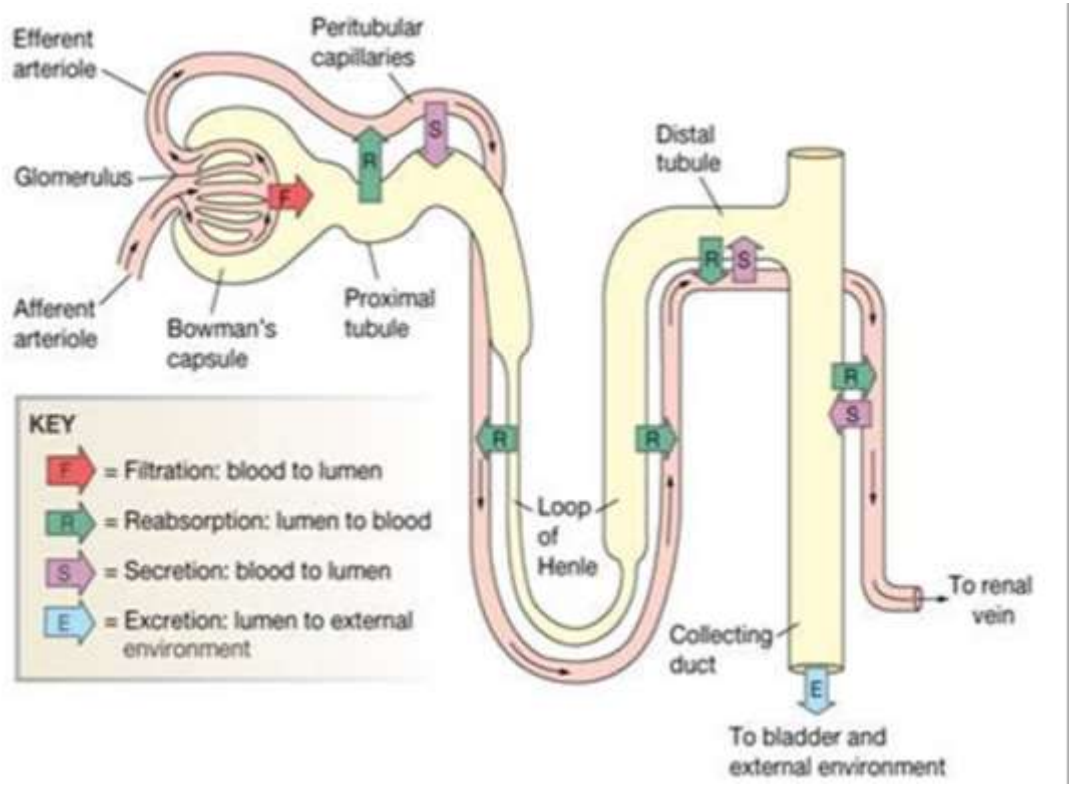
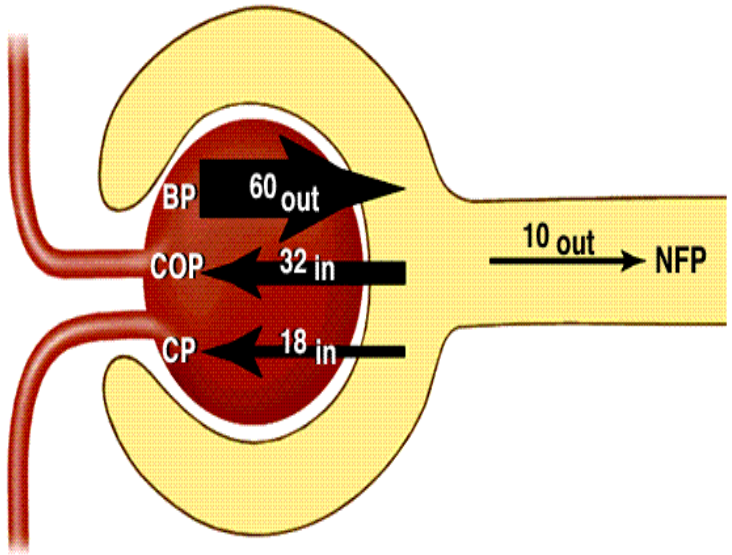
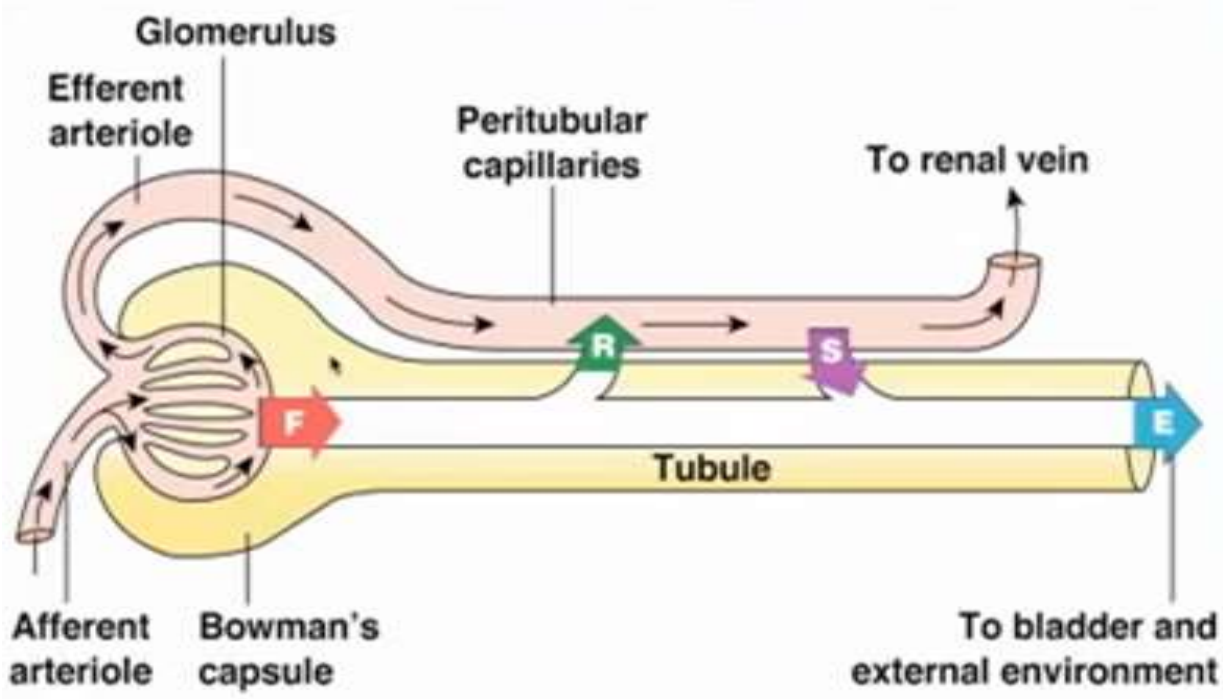
- Secretion:
- Transport of solutes from peritubular fluid into the tubular fluid



Starling Forces



Capillary blood pressure (BP)	60 mmHg out
Colloid osmotic pressure (COP)	– 32 mmHg in
Capsular pressure (CP)	– 18 mmHg in
Net filtration pressure (NFP)	10 mmHg out



Amount filtered (F) − amount reabsorbed (R) + amount secreted (S) = Amount of solute excreted (E)

filtration

- 5L Cardiac output
- 25% kidney
- 55% blood plasma of 25%= 600ml/min
- 20% Renal plasma flow=120ml/min reabsorbed most
- GFR is only 20% the remaining 80% go to efferent arterioles
- 120*60*24=180L/day
- 3L plasma in the blood
- 60 times/day

PCT

Reabsorption (Grandmom roles of handling money)

Basolateral membrane

1. Na+ and K+ pump once time energy

Apical Border

Na+ facilitated diffusion

SGLT2 Na+ and Glucose active transport

Amino acid

Ca++

HCO3-

2. GLUT2 Na+ and glucose facilitated diffusion

Secretion

Uric acid

Oxalic acid

Bile salts

Para aminoheppuric acid

Acid base balance

HCO3 reabsorption

H+ secretion

Apical membrane

Na+ and H+ exchanger secondary active transport

Carbonic anhydrase inhibiters

No more HCO3 reabsorption

Secreted as NaHCO3 in the lumen

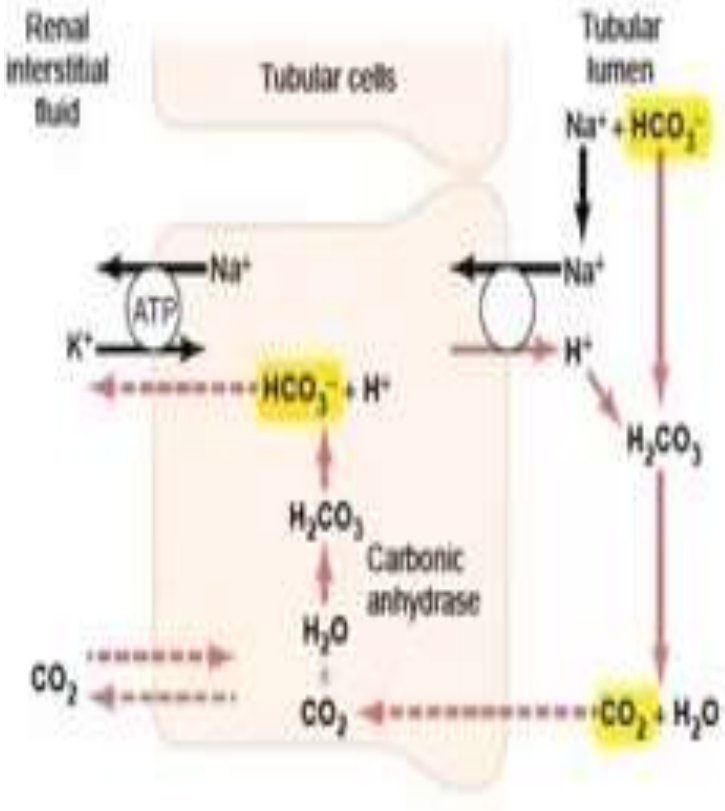
More Na+ in collecting duct

Because 60 to 70% of Na+ normally absorbed

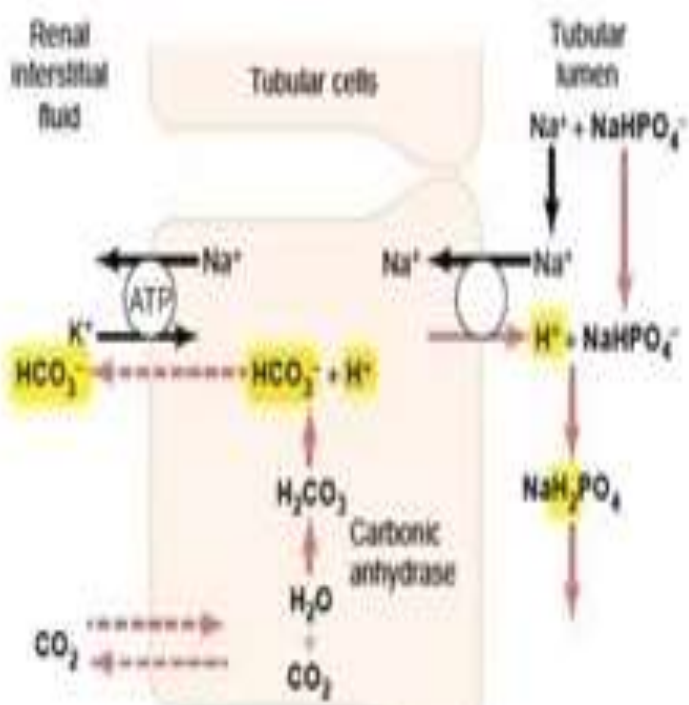
Great loss in K+

Metabolic acidosis

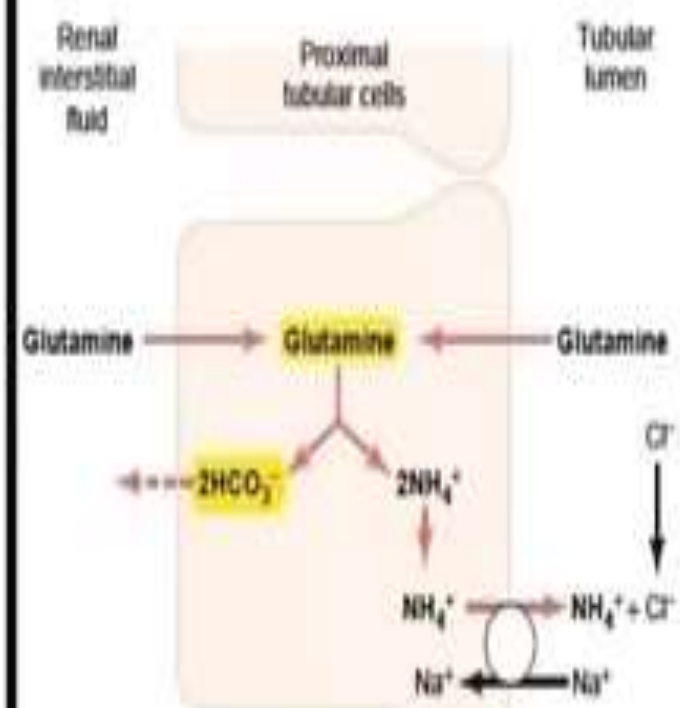
Bicarbonate Buffer



Phosphate Buffer



Ammonia Buffer



Loop of Henle

- Descending limb is only permeable to water concentrated segment

  300mosm

  1200mosm

- Thin and Thick Ascending limb is permeable to salt and water

  Diluting segment 100mosm

Basolateral membrane

Na+ K+ pump Once energy

Apical surface

Thick segment Na+ K+ 2Cl- secondary symport co-transporter

Ca+ Mg+ HCO3+ paracellular

Loop diuretics (the most powerful)

25% of Na+

Na+ K+ 2cl- that is function is :

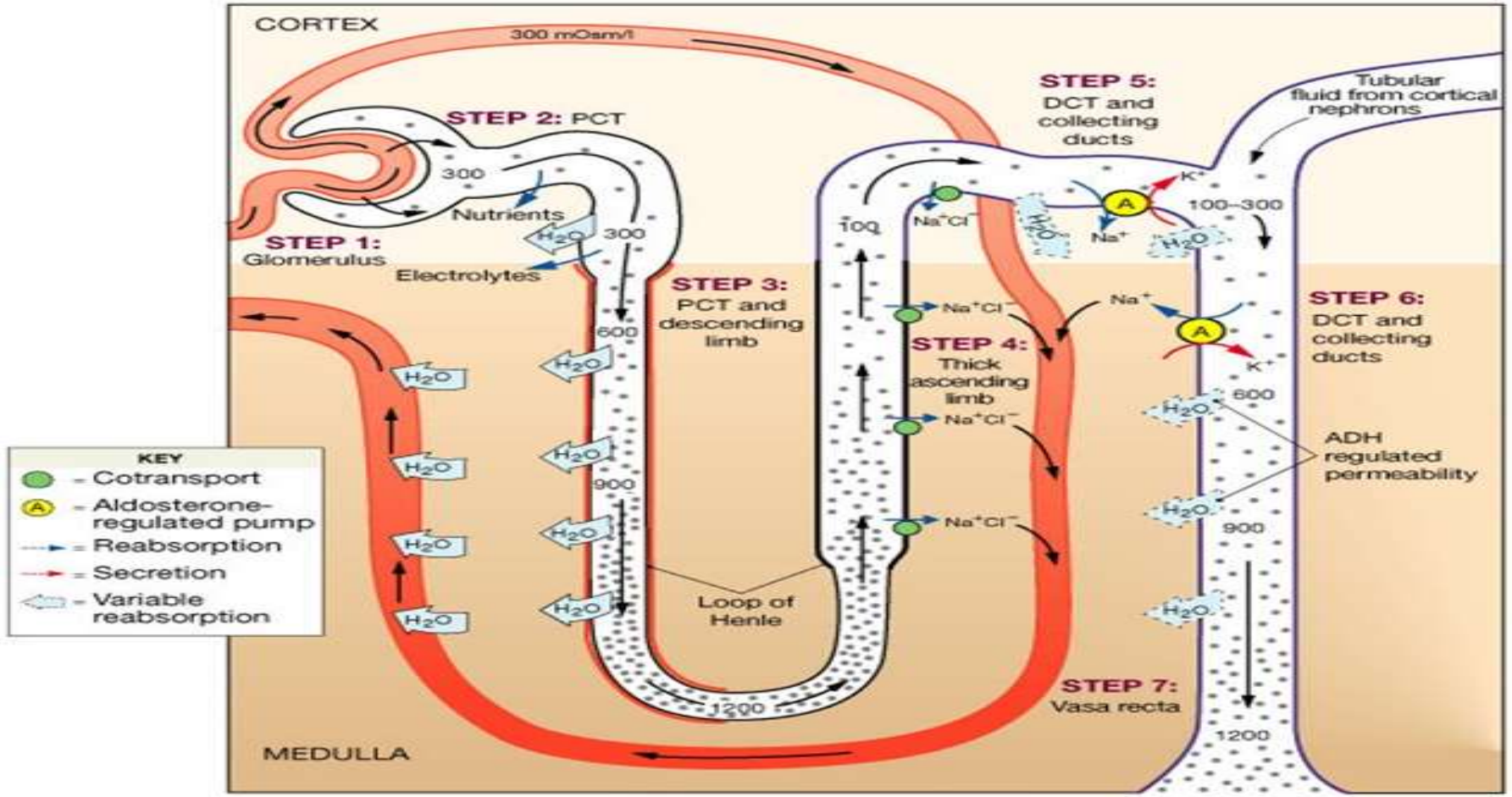
Osmolarity of medulla

Concentrated urine

Inhibiting will lead to loss more water in the urine

lost a lot of electrolytes

The Counter-Current Mechanism



Distal convoluted duct and collecting duct

Principle cells

Larger in number

Taller

Collecting duct

Aldosterone

Na and H2O

H2O reabsorption (ADH)

alpha intercalated cells

- Fewer in number
- Shorter
- Collecting duct and DCT
- H+ secretion by H+ and K+ primary active antiport aldo
- Urine limit pH 4.4

  Titratable acid
- HCO3- reabsorption