Lec 4

Some notes

- Afferent arteriole = smooth muscle cells
- glomerulus = single layer of endothelial w/ fenstrations for better filtration

* different structures b/c of different functions

Reabsorption of water & solutes

- due to single layer of epithelial tissue along the tubular system (PCT - DCT), easy passage of substances either across or between plasma membrane of epithelium to be reabsorbed in peritubular capilaries
- how do I get filtered material from kidney tubules back into blood?

I will tell this like a story

- The basal membrane of PCT faces the capillaries, & apical membrane faces the tubular lumen & has microvili (Burch border) → ↑ surface area
- basolateral membrane contains Na^+/K^+ ATPase → pumps 3 Na^+ out of cell & 2 K^+ into cell (against gradient)... because of this, Na^+ is low in cell, & K^+ is high.
- glucose & amino acids should be completely reabsorbed, this is done by co-transportation using symporters through 2ndary active transport. Due to ↓ conc. of Na^+ in cell, Na^+ from tubular fluid will go down its conc. gradient (passively) into the cell, & this will help glucose or aminos go into

the cell against its conc. gradient... Then through facilitated diffusion, gluc. & aminos will go down conc. gradient, back into blood

next.

- we also have counter-transporters... so again, Na^+ from tubular fluid goes into the cell, & pushes H^+ ions out of the cell into the PCT to be excreted in urine (2ndry active transport)

next.

- b/c Na^+ is moving into the cell & into the blood, water wants to follow through osmosis from tubule into blood
  - passive process from hypo to hypertonic area

next

- K^+ & Ca^+ are reabsorbed back into blood by moving between the tubular cells (paracellular path)
  - this is called solvent drag, b/c these ions are dissolved in water, which is what contributes to their reabsorption

* osmolality of tubular fluid is less than osmolality of interstitial fluid (due to activity of Na^+/K^+ ATPase), allowing water to move into blood

next

- urea is hydrophillic, so it is passively reabsorbed due to reabsorption of water
- Na^+ & H_2O reabsorption ↑ negative potential in tubular lumen, allowing Cl^- to be passively reabsorbed

Reabsorption mechanisms ✓ Done ... now.. lets talk about the different pathways.

Paracellular path

- between cells, through tight junctions → intercellular space → interstitial fluid → capillary wall → lumen
- for water & its solutes (Na^+, K^+, Ca^+)

* Depends on gradient

Transcellular path

- cross plasma membrane either active or passively.
- ions → through specific channels, water → aquaporins, glucose → specific transporters

* Na^+ can pass throug both routs (para or trans)
  - due to Na^+/K^+ ATPase activity

Random notes

- glucose & AA have high reabsorption (100%), but b/c they have transporters, their transport is limited by the
* # of transporters available
  - Sodium glucose cotransport has transport maximum, so if they are saturated, they can't ↑ reabsorption rate & glucose wont be reabsorbed, so you find it in urine
- urea, creatine, & ammonia have poor reabsorption
- PCT reabsorb 67% of H_2O, Na^+, Cl^-, K^+, HCO_3

* Key element is Na^+/K^+ ATPase on basolateral membrane

Change in Concentration

- poor reabsorption of creatine & urea → so higher conc. of them in tubular fluid than in plasma
- Na^+ & Cl^- conc. are almost the same in both
- glucose & AA have lower conc. in tubular fluid than in plasma