**Urine Formation in the Nephron (10.2)**

The nephron is the FUNCTIONAL UNIT OF KIDNEY. Each kidney has ~ 1 million nephrons. The various parts of the nephron move through the different regions of the kidney (medulla & cortex).

To form Urine:

1. Glomerular Filtration: movement of fluids from blood into Bowman’s Capsule (called filtrate).

2. Tubular Reabsorption: transfer of essential solutes and H2O from nephron filtrate back into blood.

3. Tubular Secretion: movement of additional wastes & excess materials from blood back into nephron filtrate.

4. Water reabsorption: removes water from the filtrate and returns it to the blood for reuse by body systems.

1. **Glomerular FILTRATION**:

* Glomerular capillary walls have many pores in their tissue walls
* Regular capillary pressure ~ 25mm Hg

Pressure in glomerulus ~ 65mm Hg Therefore high pressure

causes dissolved solutes to pass into Bowman’s Capsule.

“Glomerular” Filtrate Includes: Water, salts, nutrient molecules (inc. glucose, Na+, K+, Cl-, amino acids), waste materials (inc. urea)

(Excludes (due to size): plasma proteins, erythrocytes, platelets

Chemicals present in glomerular filtrate: P451 Table 10.1

1. **Tubular Reabsorption**: 1600L-2000L of blood passes through the kidneys per day, producing ~180L of glomerular filtrate, but ~65% is reabsorbed in the proximal tubule and LoH.

HOW is reabsorption accomplished?

P.T.-cells contain many mitochondria for *active transport* of Na+, glucose, K+, Ca2+ & amino acids back into blood

- As positive ions in P.T. move back into the blood, negatively charged ions (Cl-, HCO3+) “follow” using *passive transport*. Water follows the ions by osmosis back into the blood.

P451 Fig. 10.7

LoH: various parts of the LoH have various permeability’s to different substances:

* Descending LoH: as it moves into the medulla of the kidney the interstitial fluid becomes increasingly salty. Water diffuses from the filtrate to the blood by osmosis. As water leaves the nephron, Na+ concentration increase inside the tubule, with its max. concentration at the bottom of the LoH.
* Ascending LoH: thin portion is Impermeable to water & slightly permeable to solutes. Na+ diffuse from filtrate into the blood. Thick part of LoH, Na+ is actively moved out of the LoH causing: replenishes salty environment of medulla (so it can keep reabsorbing water), & filtrate becomes less concentrated than the tissues & blood in cortex

D.T. & C.D.: some active & passive transport of Na+, Cl- continues from filtrate back into blood.

1. **Tubular Secretion**:

Active secretion of H+ in P.T. (from blood into filtrate)

K+, H+ (even medications (penicillin)) are actively secreted into the distal tubule from the blood .

1. **Water Reabsorption:** C.D. is an area where there is lots of passive reabsorption of water from the filtrate back into the blood. If the blood plasma is too concentrated (e.g. person is dehydrated), the permeability to water in D.T. & C.D. is increased, thereby conserving water in the body.

The filtrate is now only about 1% of the original filtrate volume🡪now called urine

HMK: P455 #2,3,5,7,8,10,11,12