

### **Excretory system points for certain topic-**

#### **Selective reabsorption in kidney:**

##### PCT-

All glucose and amino acids are reabsorbed by active transport.

Most of Na(70%), most of K(75%) and large amount of Cl are reabsorbed by active transport.

Urea, uric acid and creatinine.

75% of water by osmosis.

##### Henle loop

DL- 5% water by osmosis.

AL- 25% K and some Cl actively reabsorbed.

##### DCT-

Actively reabsorbs Na

Some Cl by diffusion.

#### **Hormonal control of urine formation-**

ADH/ vasopressin acts on the membrane of the collecting ducts of nephron.

This increases the permeability of the ducts to water, so that more water is taken back into the blood.

In the absence of ADH, ducts become impermeable leading to diuresis.

Aldosterone has an indirect effect, this hormone induces the DCT to reabsorb more Na and water.

Thyroxine also plays an indirect role in urine formation.

### Counter current mechanism

Henle's loop and vasa rectae play an important role in this mechanism.

Glomerular filtrate in the Henle's loop and blood in the vasa rectae flow in opposite directions in the two limbs of the loops i.e., towards the renal medulla in the descending limb, and towards the renal cortex in the ascending limb.

These two counter current systems help in concentrating the urine.

In the Henle's loop, filtrate loses NaCl to the renal medulla from the narrow region and Na<sup>+</sup> & Cl<sup>-</sup> by active transport in the wide region of the ascending limb.

Thus, concentration of interstitial fluid increases.

Water is drawn by osmosis from the narrow region and the collecting duct. Water enters the vasa recta and is carried away.

Thus, concentration of solutes in the interstitial fluid is high.

In the vasa recta, as blood flows in the descending capillary, water is drawn out from the blood plasma by osmosis.

Na and Cl ions enters in the blood plasma by diffusion.

As blood flows from the ascending capillary, the reverse occurs.

Water reenters and Na<sup>+</sup> & Cl<sup>-</sup> leaves it due to decrease in conc of interstitial fluids.

The counter current mechanism concentrates the urine by maintain a high salt conc in the interstitial fluid. This is called as the **counter current multiplier mechanism**.

**COUNTERCURRENT MULTIPLICATION: LOOPS OF HENLE** — In humans, the maximum urine osmolality that can be attained is 900 to 1400 mosmol/kg; the normal plasma osmolality is much lower at about 285 mosmol/kg. Since the urine becomes concentrated by equilibrating with the medullary interstitium, this means that a similar high osmolality must be achieved in the interstitium. The process by which the interstitial osmolality in the medulla is increased from 285 mosmol/kg (isosmotic to plasma) to 900 to 1400 mosmol/kg is called countercurrent multiplication. (Countercurrent refers to the opposite directions of flow in the descending and ascending limbs that result from the hairpin configuration of the loop.)