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EXPLAIN URINE FORMATION AND CONCENTRATION

URINE FORMATION

Waste is excreted from the human body mainly in the form of urine. Our kidneys play a major role in the process of excretion. Constituents of normal human urine include 95 percent water and 5 percent solid wastes. It is produced in the nephron which is the structural and functional unit of the kidney. Urine formation in our body is mainly carried out in three phases namely

1. Glomerular filtration,
2. Reabsorption
3. Secretion.



Mechanism of urine Formation

The mechanism of urine formation involves the following steps:

**1.Glomerular Filtration**

Glomerular filtration occurs in the glomerulus where blood is filtered. This process occurs across the three layers- epithelium of Bowman’s capsule, endothelium of glomerular blood vessels, and a membrane between these two layers.

Blood is filtered in such a way that all the constituents of the plasma reach the Bowman’s capsule, except proteins. Therefore, this process is known as ultrafiltration.

**2.Reabsorption**

Around 99 percent of the filtrate obtained is reabsorbed by the renal tubules. This is known as reabsorption. This is achieved by active and passive transport.

**3.Secretion**

The next step in urine formation is the tubular secretion. Here, tubular cells secrete substances like hydrogen ion, potassium ion into the filtrate. By this process, the ionic, acid-base and the balance of other body fluids are maintained. The secreted ions combine with the filtrate and form urine. The urine passes out of the nephron tubule into a collecting duct.

CONCENTRATION

Urine concentration is the collection of waste materials in urine for excretion by the body.

This process takes place in the kidneys. Blood flows into the kidneys and through a network of structures known as nephrons that allow fluid and salts to flow across a semi-permeable membrane. When the body has excess salts and other materials it needs to eliminate, these pass readily through, leaving fluid behind. If there is too much fluid, the nephrons can excrete this across the membrane. Waste materials are prepared for elimination, while materials the body still uses can be recycled and sent into the bloodstream through the process of reabsorption. The amount of urine concentration that occurs depends on the hydration levels in the body and the production of a compound known as antidiuretic hormone, or vasopressin. This hormone triggers the kidneys to retain water, leading to more concentrated urine.

The body regulates urine concentration to maintain a stable balance of fluids and salts in the blood chemistry. People who are dehydrated tend to produce extremely concentrated urine which may be dark, with a strong odor. Dehydrated bodies need water, and can afford to excrete only a small amount to get rid of waste materials. After water loading, like drinking lots of water during sports to stay hydrated, the body may excrete relatively dilute urine.

Health conditions can adversely affect urine concentration. Kidney damage may make it harder to filter the blood, which creates excessive thirst and very dilute urine. Patients who cannot concentrate their urine need ample supplies of water to flush unnecessary salts out of their bloodstream. Eventually, they may become so impaired that they require external hemodialysis to filter their blood. Such patients may ultimately need a kidney transplant.