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Pharmacology

PHS212

Explain urine formation and concentration

Urine formation

Formation of urine is a process important for the whole organism. Not only acid-base balance is modulated by it, but also blood osmolarity, plasma composition and fluid volume, and thus it influences all cells in our body.

The basic functional unit for the urine formation is called nephron

A healthy adult person produces 1.5-2 liters of urine per day and this process involves three basic mechanisms:

1) Glomerular filtration

2) Tubular reabsorption

3) Tubular secretion

Glomerular Filteration

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.

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.

Secretion

The next step in urine formation is the tubular secretion. Here, tubular cells secrete substances like hydrogen ion, potassium ion, etc 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.

Urine concentration

A urine concentration test determines how well your kidneys are functioning. The test may be used to test your kidneys' response to:

- too much fluid intake (water loading)
- too little fluid intake (dehydration)
- a hormone that should concentrate your urine, antidiuretic hormone (ADH)

The main reason this test is ordered is to see if you are suffering from central diabetes insipidus — a disease that causes excessive urination. This form of diabetes can occur when a head injury affects how your brain releases antidiuretic hormones (ADH). ADH normally increases the amount of water the kidneys retain. In central diabetes insipidus, your brain does not release enough ADH.

A urine concentration test can also be used to evaluate:

- dehydration
- kidney failure
- heart failure
- other hormone problems
- complications of a urinary tract infection