Excretion and osmoregulation

Excretory products and their elimination

Lecture 6

URINE FORMATION / PHYSIOLOGY OF URINE

Process of urine formation completed in three steps

1. Ultra filtration /glomerular filtration
2. Selective reabsorption
3. Tubular secretion /augmentation

BLOOD

PLASMA

1. Water(98%)
2. Protein
3. Nutrient
4. Gases
5. Mineral
6. Clotting factor
7. Nitrogenous waste

NH3, urea ,uric acid

CORPUSCLES

- R.B.C
- W.B.C
- PLATLETS

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Selective reabsorption

It is the process whereby important molecules like ions , glucose , amino acids etc. water from filtrate are reabsorbed as they pass through the nephron /renal tubule.

Renal tubule	Peritubular capillary
filtrate	blood
Deproteinised plasma	
Primary urine	

1. PCT is place of reabsorption.
2. It is highly coiled so that glomerular filtrate passes through it very slowly.
3. Columnar cells of PCT are provided with microvilli due to which absorptive area increases enormously.
4. This makes the process of reabsorption very effective.

high threshold Substances

considerable importance / 100 % reabsorption

like - glucose,

amino acids, Vit.C, Ca^{++}, K^{+}, Na^{+}, Cl^{-}

low threshold Substances

considerable low importance / very less reabsorption

like - water,

sulphates, nitrates, etc. **urea / nitrogenous waste**

Diffusion

it is movement of molecule from region of higher concentration to region of lower concentration /along concentration gradient without expenditure of energy

Types of reabsorption

1. **Active transport**
2. **Passive transport**

Active transport

The movement of molecules from lower concentration to higher concentration / against concentration gradient with use of energy /ATP

Active transport

High threshold substance **like - glucose, amino acids, Vit.C, Ca++, K+, Na+, Cl⁻ are absorbed actively**

Passive transport

The movement of molecules from higher concentration to lower concentration / along concentration gradient with no use of energy /ATP

passive transport

low threshold substance **like water, sulphates, nitrates, etc. are absorbed passively**

In this way, about 99% of glomerular filtrate is reabsorbed in PCT and DCT.

Tubular secretion / Augmentation :

Finally filtrate reaches the distal convoluted tubule via loop of Henle.
Peritubular capillaries surround DCT.
Cells of distal convoluted tubule and collecting tubule actively absorb the wastes like **creatinine and ions like K+, H+ from peritubular capillaries** and secrete into lumen of DCT and CT,
Thereby augmenting the concentration of urine and changing its pH from **alkaline to acidic**.
Secretion of H+ ions in DCT and CT is an important homeostatic mechanism for pH regulation of blood.
This process is called as **tubular secretion or augmentation**.

Composition of urine

URINE

COMPOSITION OF URINE PRODUCED DEPENDS UPON THE FOOD AND FLUID CONSUMED BY THE INDIVIDUAL

1.2-1.5 LITERS/DAY

YELLOW COLOUR OF URINE-UROCHROME

PH-5-7

SPECIFIC GRAVITY-1.01-1.03

URINE

95%-H2O

2.5% NITROGENOUS WAS
UREA,URIC ACID,CREATIN

1.5% SALTS

TRACE –PIGMENTS ,DRUG