

Ammonotelic animals

Aquatic amphibians, aquatic insects, bony fishes

Ammonia is the most toxic excretory product and requires a large amount of water

Ureotelic animals

Terrestrial amphibians, marine fishes and mammals

Produced in liver and filtered by kidneys for excretion

Uricotelic animals

Insects, land snails, reptiles and birds

Least toxic and requires minimum water for excretion

Protonephridia or
flame cells

Platyhelminthes or
flatworms, rotifers,
cephalochordates
(*Amphioxus*), some annelids

Malpighian tubules

Most of the insects,
e.g. cockroaches

Nephridia

Earthworm and other
annelids

Antennal or green glands

Crustaceans including prawns

Columns of Bertini

Renal columns of cortical tissues present between medullary pyramids

Renal corpuscle or malpighian body

Made up of-
Glomerulus- tuft of capillaries of afferent arteriole

Bowman's capsule- cup like structure, which encloses glomerulus

Cortical nephron

Henle's loop is very short

Vasa recta is absent or highly reduced

85% of nephrons

Juxta medullary nephron

Henle's loop is long and goes deep in the medulla

Vasa recta is present. It is a u-shaped peritubular capillaries running parallel to Henle's loop (arising from efferent arteriole)

15% of nephrons

Podocytes

Epithelial cells of Bowman's capsule

Juxta glomerular apparatus (JGA)

Formed by DCT and afferent arteriole

Regulate GFR by releasing renin

Reabsorption

99% of filtrate is reabsorbed by tubules

Active absorption- Na^+ , glucose, amino acids

Passive absorption- nitrogenous wastes and water

Proximal convoluted tubule (PCT)

Lined by simple cuboidal epithelium with brush border

Maximum reabsorption- nutrients, electrolytes, water and HCO_3^-

Selective secretion- K^+ , H^+ and ammonia

Henle's loop

Helps in maintaining high osmolarity of interstitial medullary fluid and concentration of filtrate

Descending limb- water reabsorption

Ascending limb- electrolytes reabsorption

Distal convoluted tubule (DCT)

Reabsorption of Na^+ , water and HCO_3^-

Selective secretion- K^+ , H^+ and ammonia

Collecting duct

Reabsorption of water and some urea

Selective secretion- K^+ , H^+

Counter current mechanism

Maintains concentration gradient

Flow of filtrate and blood in Henle's loop and vasa recta respectively in opposite direction forms counter current

Regulation by ADH/ Vasopressin

Synthesised in hypothalamus and released from neurohypophysis

Regulates water reabsorption

Renin-Angiotensin mechanism

Decrease in blood pressure and GFR stimulates release of renin from JG cells

Renin converts angiotensinogen to angiotensin I and then to angiotensin II

Angiotensin II- vasoconstrictor and increases GFR

Release of aldosterone from adrenal cortex resulting in reabsorption of Na^+ and water from DCT

Atrial natriuretic factor (ANF)

Released by the atria of heart due to increased blood flow

Vasodilator and antagonises constriction by renin-angiotensin mechanism

Micturition

Micturition reflex from CNS causes contraction of smooth muscles of urinary bladder and relaxation of urethral sphincter

1-1.5 l urine and 25-30 g of urea per day are excreted. It is slightly acidic (pH = 6.0)