Class : Zoology
Class : XI

Kannada

EXCRETORY PRODUCTS AND THEIR ELIMINATION

EXCRETORY WASTE

Metabolism — Excess ingestion

→ Results in accumulation of

→ Nitrogeous wastes – NH_2 , urea, uric acid

→ Other contents – CO_2 , H_2O, ions (Na^+, K^+, CI^-, PO_4^{3-}, SO_4^2)

Removed ↓
Partially/Competely

Common Nitrogenous Wastes

Nature of nitrogenous waste formed and their excretion vary among animals depending on the habitat/availability of water

Common nitrogenous waste	Nature & Examples	Toxicity level and water required	Special Features
Ammonia (Ammonia converts into urea in liver)	**Ammonotelic** Aquatic insects Many bony fishes Aquatic amphibians	Maximum	• Diffusion through gills surface or body surface as ammoium ions
Urea	**Ammonotelic** Aquatic insects Many bony fishes Aquatic amphibians	Lesser	• **Kidneys** filter urea from blood
Uric acid	**Uricotelic** Land snails Insects Reptiles Birds	Least	• Pellet/Paste (Semi-solid) Minimum loss of water
• Kidneys do not play a significant role in removal of ammonia			

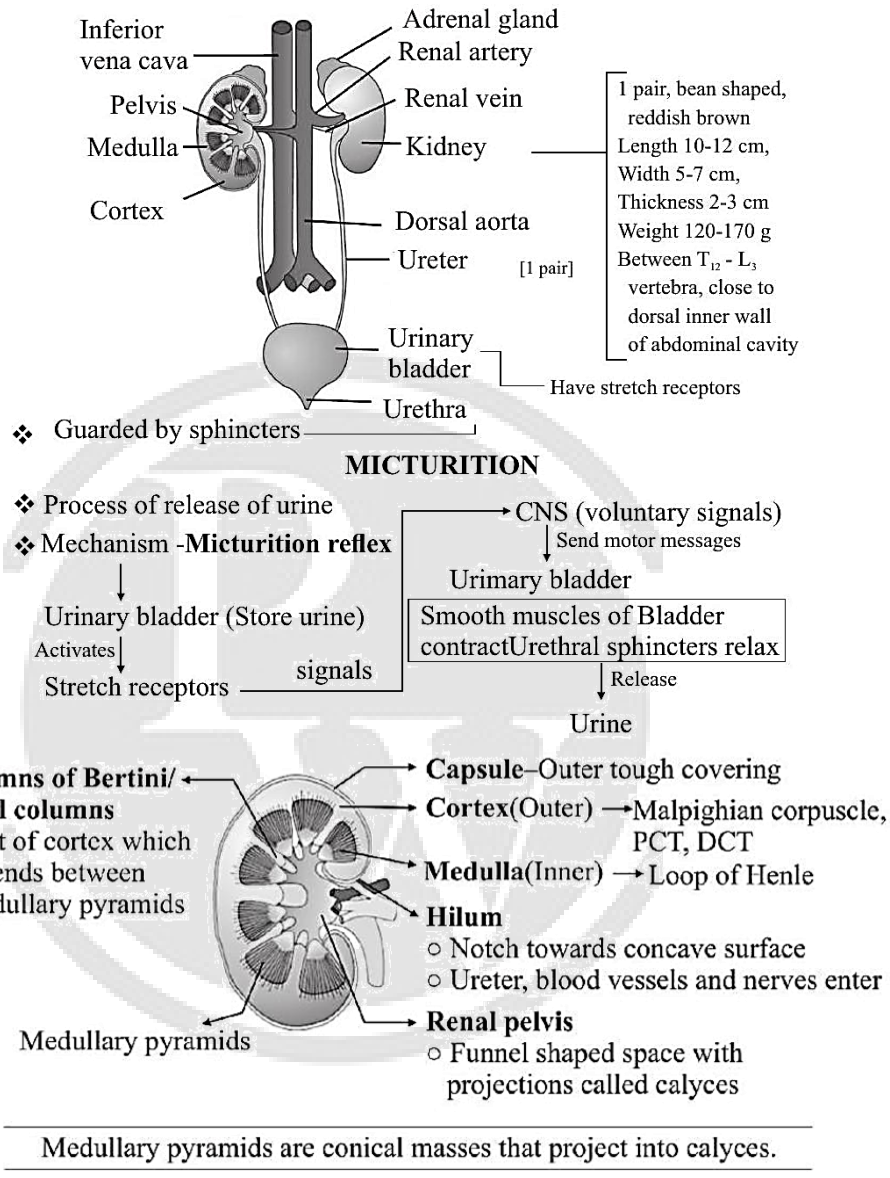
Different Excretory Structures

Excretory strcuture eliminate nitrogenous waste & maintain fluid and ionic balance

Structures	Examples
• Protonephridia/flame cells (osmoregulation)	• Platyhelminthes (Planaria) Rotifers Some annelids Cephalochordates (Amphioxus)
• Nephridia	• Annelids (Earthworms)
• Malpighian tubules	• Insects (Cockroaches)

Antennal/Green glands	Crustaceans (Prawn)
• Function of excretory structures: • Eliminate nitrogenous wastes. • Maintain ionic and acid-base balance of body fluids, i.e., osmoregulation	

Kidney

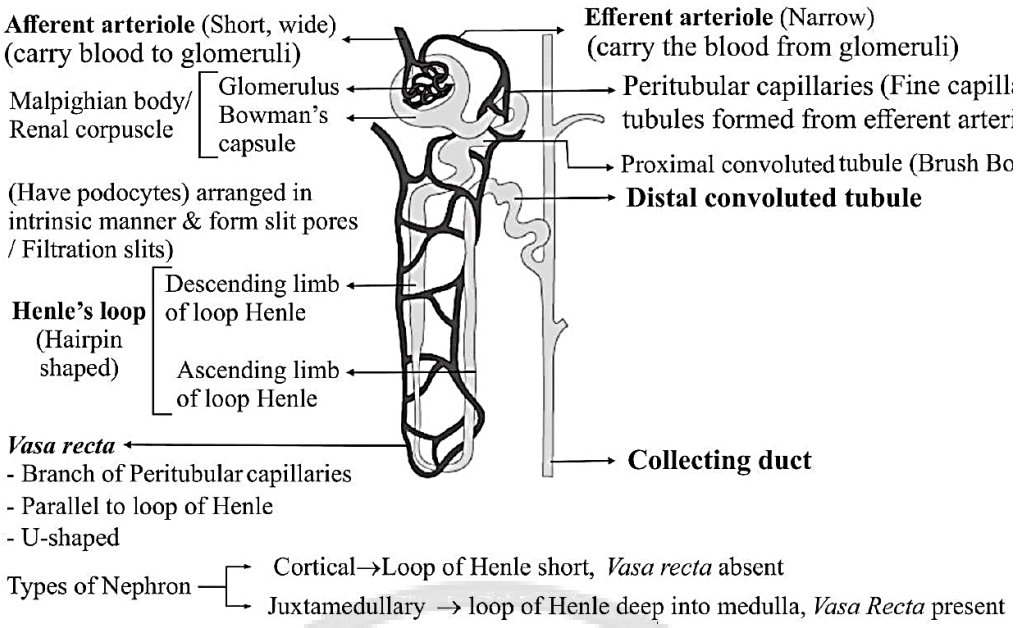


Medullary pyramids are conical masses that project into calyces.

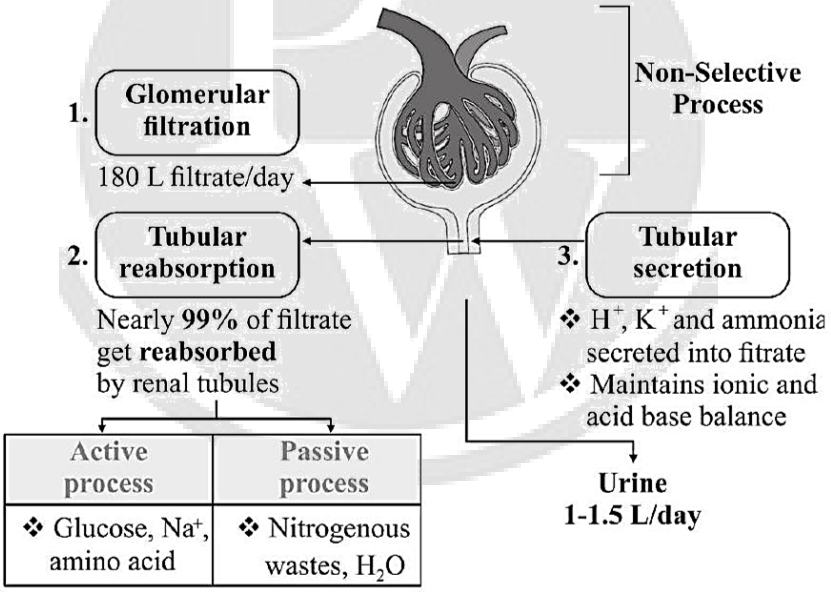
Kidney

Functional unit of kidney Nearly 1 million complex tubular structure

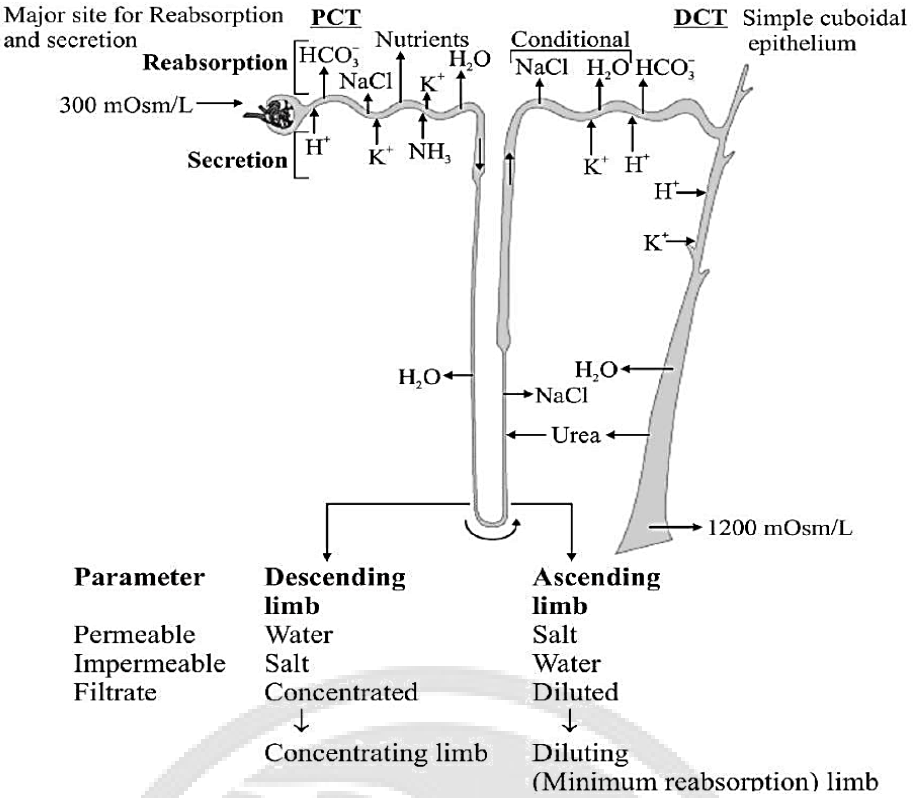
Each nephron has two parts - (i) Glomerulus (ii) Renal Tubules (Tuft of capillaries, line by simple squamous epithelium)



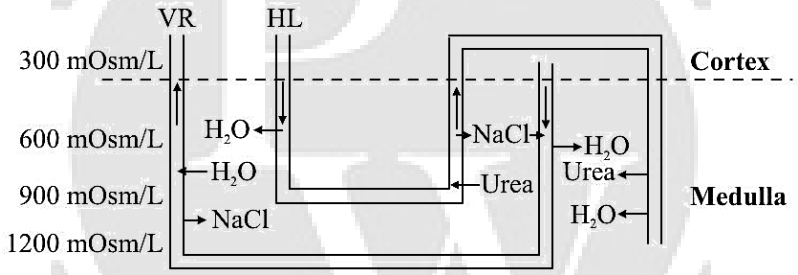
- ❖ Juxtaglomerular apparatus (JGA): Cellular modifications in DCT and afferent arteriole at the location of their contact.
- ❖ JGA is composed of JG Cells and Macula densa. DCT and collecting duct concentrate the filtrate about four times.



FUNCTIONS OF THE TUBULES



Operates between the two limbs of loop of Henle and vasa recta



REGULATION OF KIDNEY FUNCTION		
Hypothalamus	**JGA/ Renin-Angiotensin Mechanism**	**Heart**
Works when GFR Low, Blood Volume Low ❖ osmoreceptors in hypothalamus activated. ❖ Release of ADH/ Vasopressin ↓ Prevent Diuresis	Low GFR/ Glomerular blood flow/Glomerular blood pressure Activate↓ JG cells to release renin Angiotensinogen (Liver) → Angiotensin I ACE - Angiotensionogen converting enzyme **Angiotensin II** **Activate** (Vasopressin) ❖ Adrenal cortex aldosterone ↓ Reabsorption of Na+ & water from distal part of Tubule ↓ Blood pressure and GRP increase	Increase blood flow to atria of heart ↓ Release of ANF (Atrial natriuretic factor) ↓Work Vasodilation ↓Result ❖ Blood pressure decrease ❖ GFR decrease ❖ Checks on Renin-Angiotensin Mechanism

Characteristics and Composition of Urine

- Colour - Light yellow
- pH = 6
- Odour - Characteristic
- Urea - 25-30 gm/day
- Glucosuria [Glucose in urine]
  Ketonuria [Ketone in urine] } Diabetes mellitus

Role of Other Organs in Excretion

Accessory structure	Basic work
Lungs	Remove large amount of CO_2 Approximately 200 mL/min Remove significant quantity of water
Liver (Largest gland)	Remove Bile-containing substances along with Digestive wastes.
Skin Sweat gland	Removes NaCl, urea and lactic acid Facilitates cooling effec
Sebaceous gland	Removes steroles, hydrocarbons, waxes.
Salivary glands	Small amount of nitrogenous wastes are eliminated through saliva

Disorders of Excretory System

Disorders	Basic work
Renal calculi	Stone or insoluble mass of crystalised salts (e.g., oxalates)
Glomerulonephritis	Inflammation of glomeruli of kidney
Renal/kidney failure	Malfunctioning of kidneys may lead to kidney failure. **Treatment** (i) Haemodialysis: Process to remove urea from blood (ii) Boon for thousands of uremic patients all over the world. (iii) Composition of dialysing fluid is same as plasma except the nitrogenous wastes.
	(ii) Kidney transplantation Ultimate method in correction of acute renal failure • Functional kidney is taken from donor • To minimise rejection, close relatives are preferred as donor • Modern clinical problems have increased success rate of such complicated technique



PW Web/App - https://smart.link/7wwosivoicgd4
Library- https://smart.link/sdfez8ejd80if