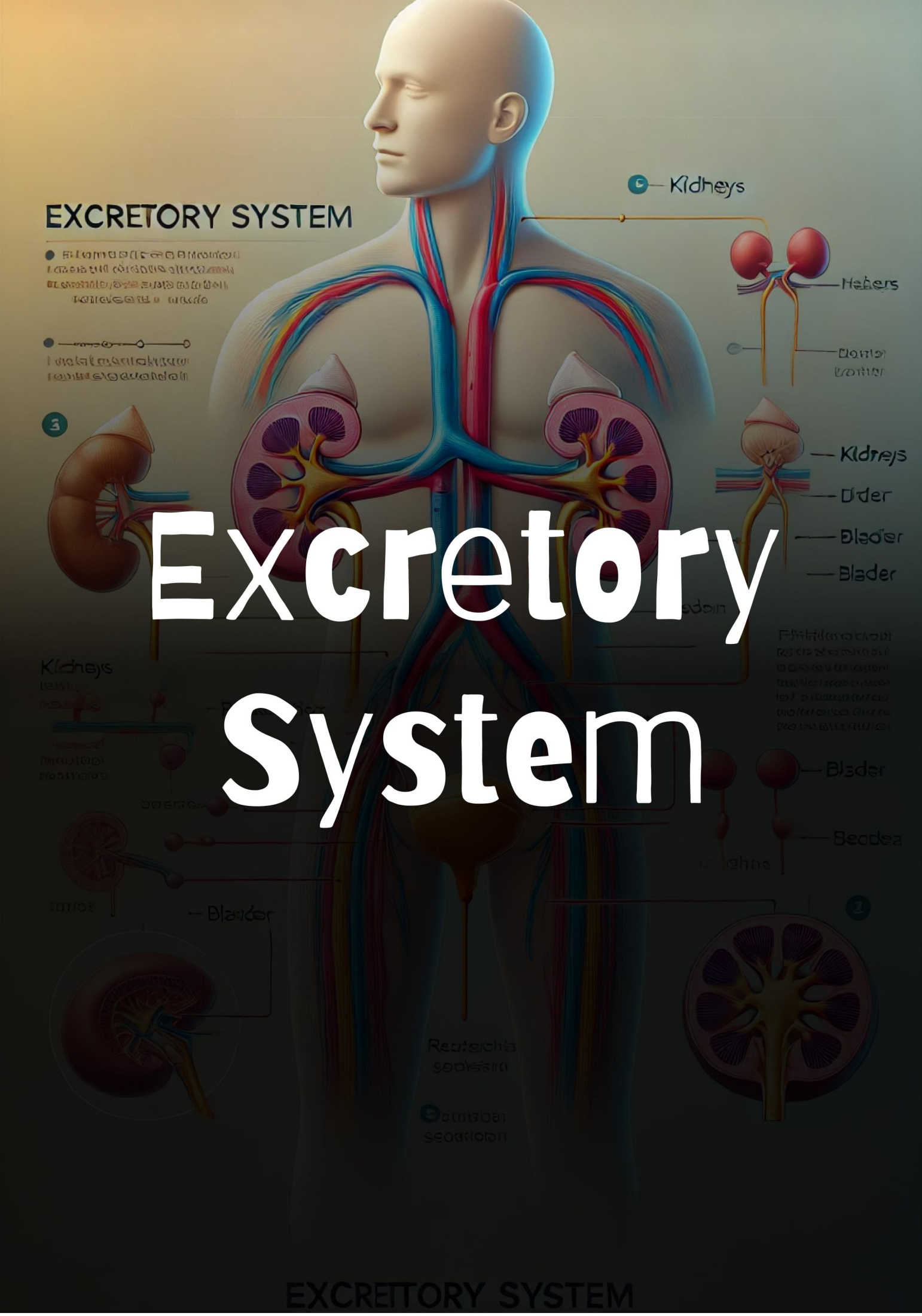

Excretory System

Hameostasis : Watter Cannon

- Maintain the internal Environment constant.
- Body temperature 98.6 °F. (37.4 °C) → Sweating.
- **Osmoregulation :**
  Maintain Asmolarity (concentration of Solute and Solvent)
- concentration of blood plasma
- So 300 Act as a isotonic.
- More than 300 → Hypertonic.
- Less than 300 → Hypotonic.

Excreation

- Removal of nitrogenous waste and Excess substances from body.
- on the basis of Osmoregulation Animals are

Osmoconformers

(i) can't maintain Osmolarity invertebrate.

Osmoregulators

(i) Maintain the Osmolarity Actively.
Except - Hag, Fish, (Myxine)

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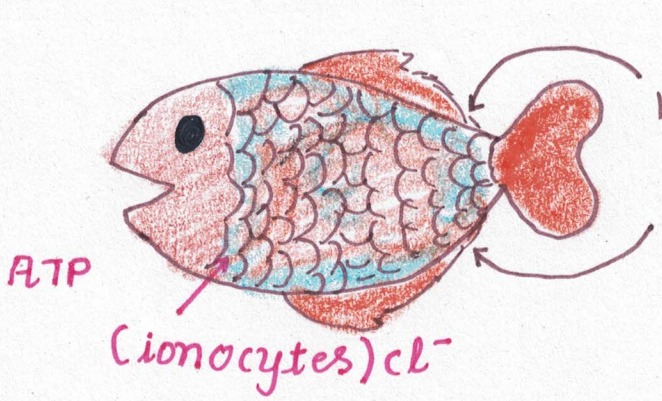
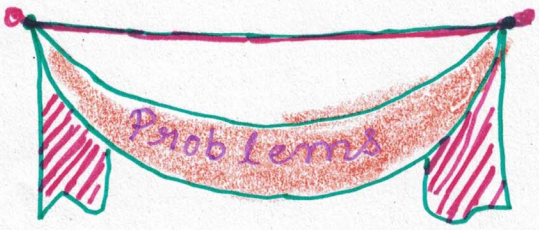
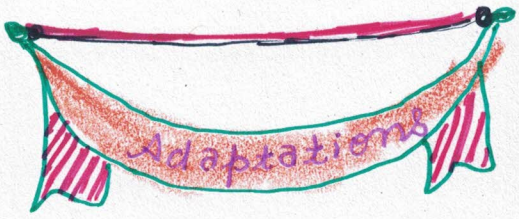
Osmoregulation in water (freshwater)

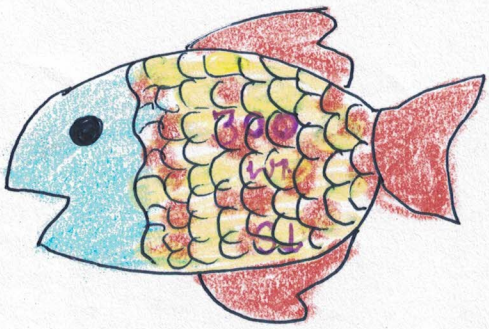




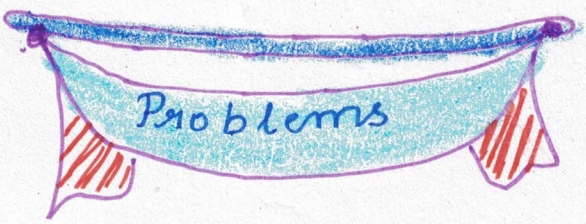


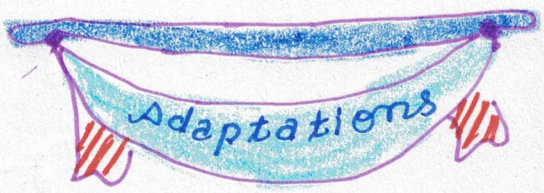
- Excess of H_2O
- Lack of Salt

- Don't drink water, dilute urine
- Impart ions Actively.



Marine water
W ↓
S ↑
Hypertonic (1000)





- Lack of H_2O
- Excess of Salt

- Drink's water
- Monovalent → Urine
- Bivalent → faecal matter (colon)

Urea Act as a Osmolite → Terrestial Adoption.

Terrestial Animals

Kangaroo rat Nocturnal.

Very long loop of Henle → concentrated urine.

Take oily food / Seeds → (oxidation of food → water)

Very few Sweat Glands.

CAMEL

Drink 80 l water in 10 min.

Stone fat in hump. (white fat).

	Ammonotelic	Uriotelic	Uricotelic
Nitrogeneous waste	Amonia	Urea	Uric Acid 2,6,8 trioxy - Purine least
Toxicity	Maximum	More	Least
Requirement of water	Maximum	More	Least
Mechanism	Dissolve with water as Ammonium ions and Pass out through body	NH_3 ↓ liver ornitation cycle Urea ↓ Elimate ↓ Kidney	

Surface via diffusion →	Eg:- human, Adult, Amphibians, Marine fish	Eg:- Birds, Reptiles, land Snail
Kidney do not play imp. role. No need of ATP.		

Example → Aquatic Insect
Aquatic Amphibian
Bony fishes (Telosts)

Excretory Organs in Various Organism

Platyhelminthes (flatworm) → Firstly Seen →

Rutifush,

Cephalochordata → Protonephridia / flame cells / Solenocytes

Earthworm → Nephridia.

Cockroach → Malphighian tubule.

Crustaceans → Prown Green Glands.

Aschelminthes → Protonephridia / Renette cells.

Spider — coaxal glands.

Molluscs — Organs of Bojanus.

Balanoglossus — Proboscis gland

Herdmania — Pyloric gland.

Pronephric kidney — cyclostomata and tadpole.

Mesopepheric Kidney — fish and Amphibians.

Matenephric kidney — Reptiles, Aves and Mammals.

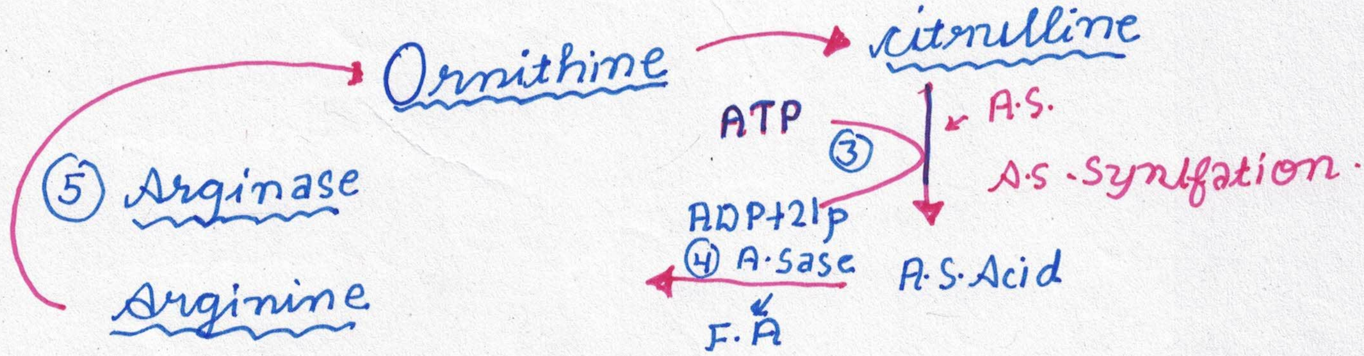
Ornithine cycle / Krab Hanseleit cycle

$2NH_3 + 1CO_2 + 3ATP$

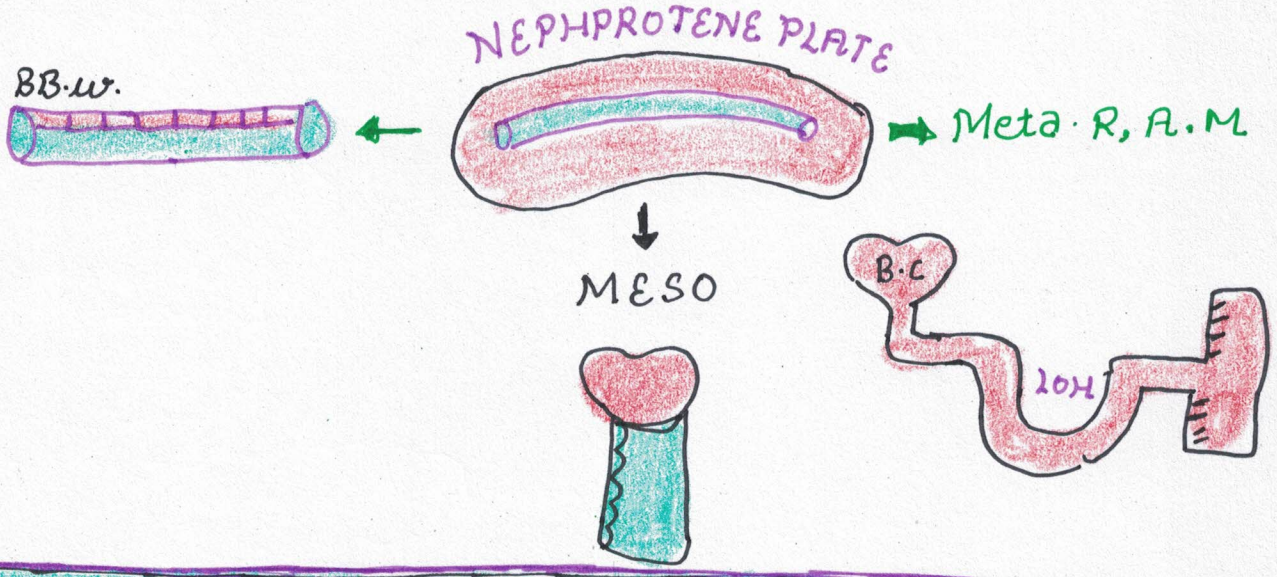
Urea forming Enzyme → Arginase

$$2NH_3 + 1CO_2 \xrightarrow{\text{① C.P.S}} C.P. \xrightarrow{\text{② O.C.T.}}$$

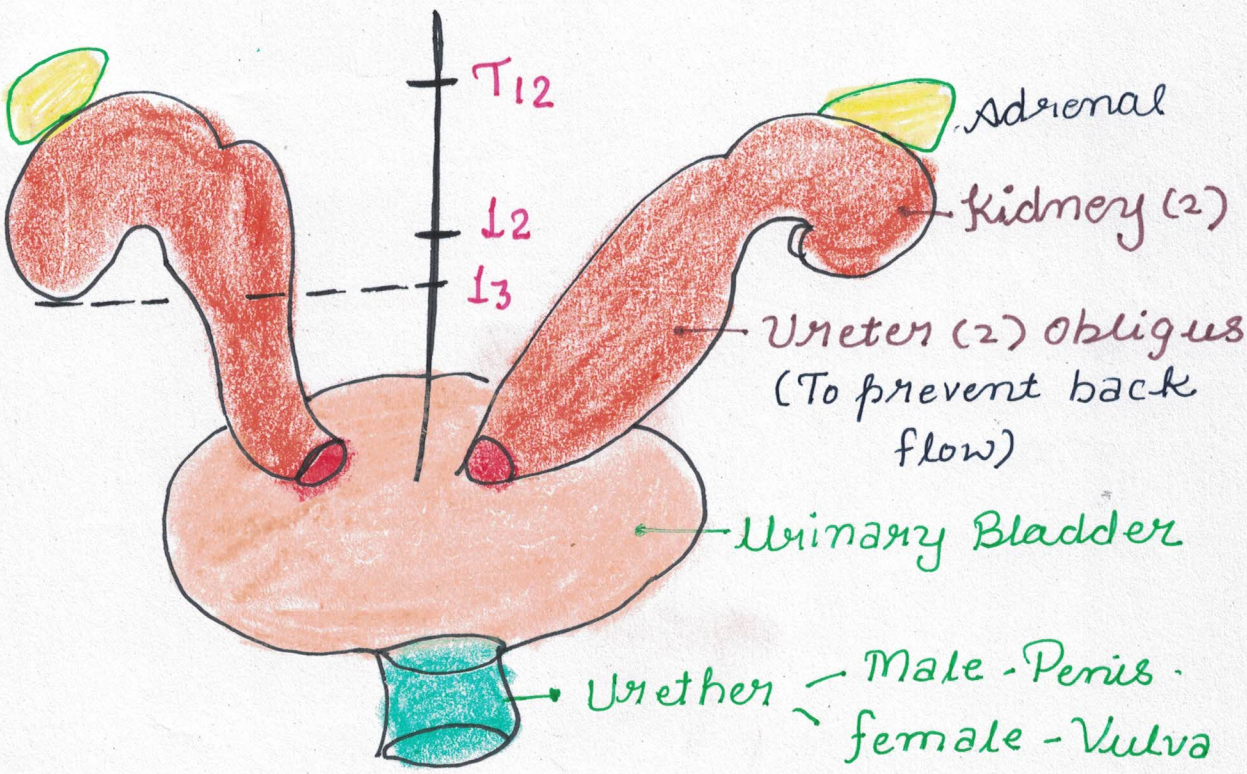
2A.T.P → 2ADP + 2iP



Types Of Kidney



Human Excreatary System



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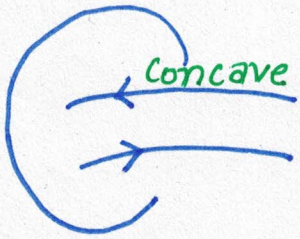
KIDNEY

- Mesodermal
- Metanephric
- Reddish Brown
- Bean Shaped.
- Retroperitoneal ⇝ Dorsally Attach with abdominal wall so ~~Velocity~~ Ventrally covered with peritomium.
- If one kidney remove another will increase in size

↓

Compensatory Hypertrophy.

- Size 10-12 x 5-7 x 2-3 cm
- convex



- In Each kidney.
  - ★ No. of Nephrons → 1 Million
  - ★ 4000 Nephrons open into a collecting duct.
  - ★ collecting duct is not a part of Nephron.
  - ★ Pelvis is not a part of a kidney.

During Micturition

- Urinary bladder contract
- Urethral Sphincter Relax

} Para Sympthic Nervous System.

- Normal Micturition desire = 220 ml.
- Normally Micturition = 300 ml.
- Discomfort = 500 ml
- Max. capacity = 1 litre

Path of Nephric filtrate & Urine

BC → PCT → Loop of Henle → DCT → C.D. → Dilute Ballens → Penal Paptilla

C.D. → P M D → urine

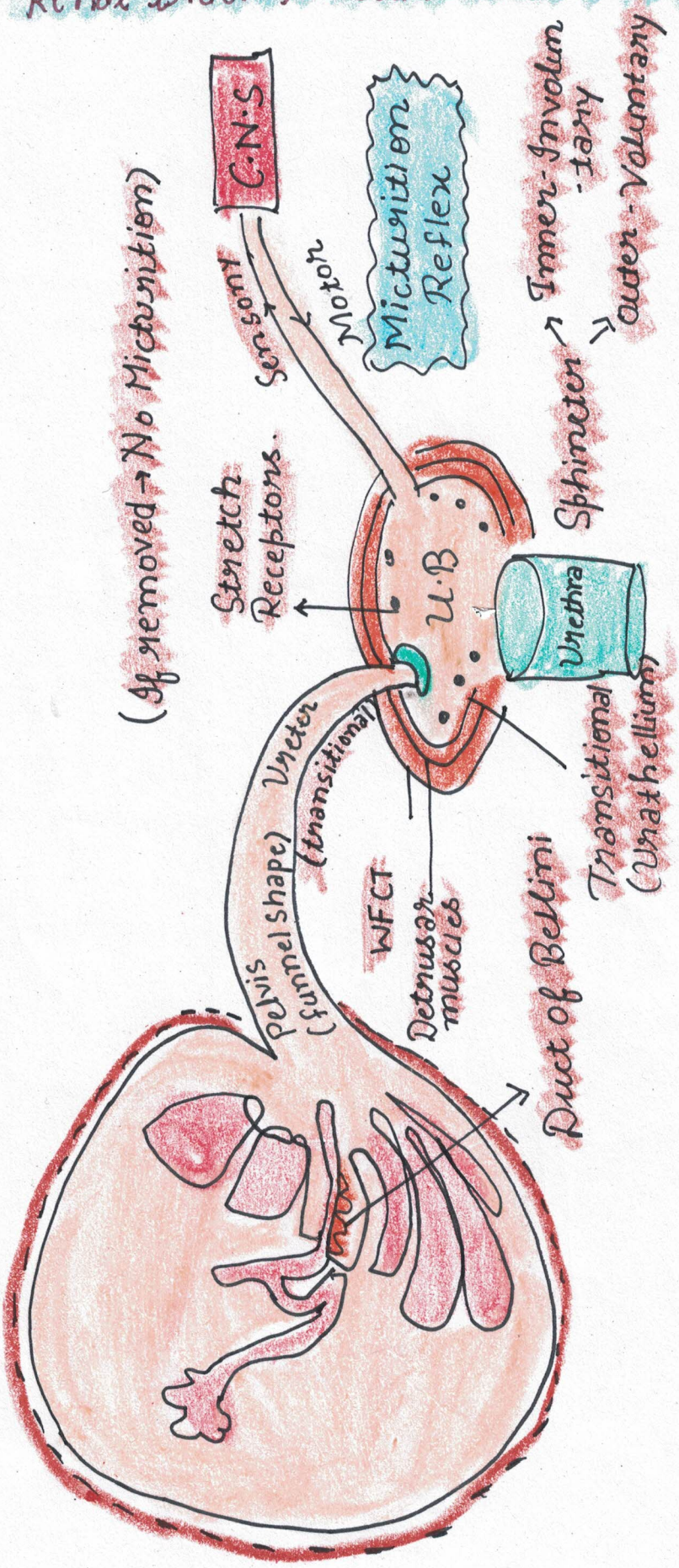
N.fil (Nephric filterate)

Urinary bladder ← Ureter ← Pelvis ← Major Calyx ← minor calyx

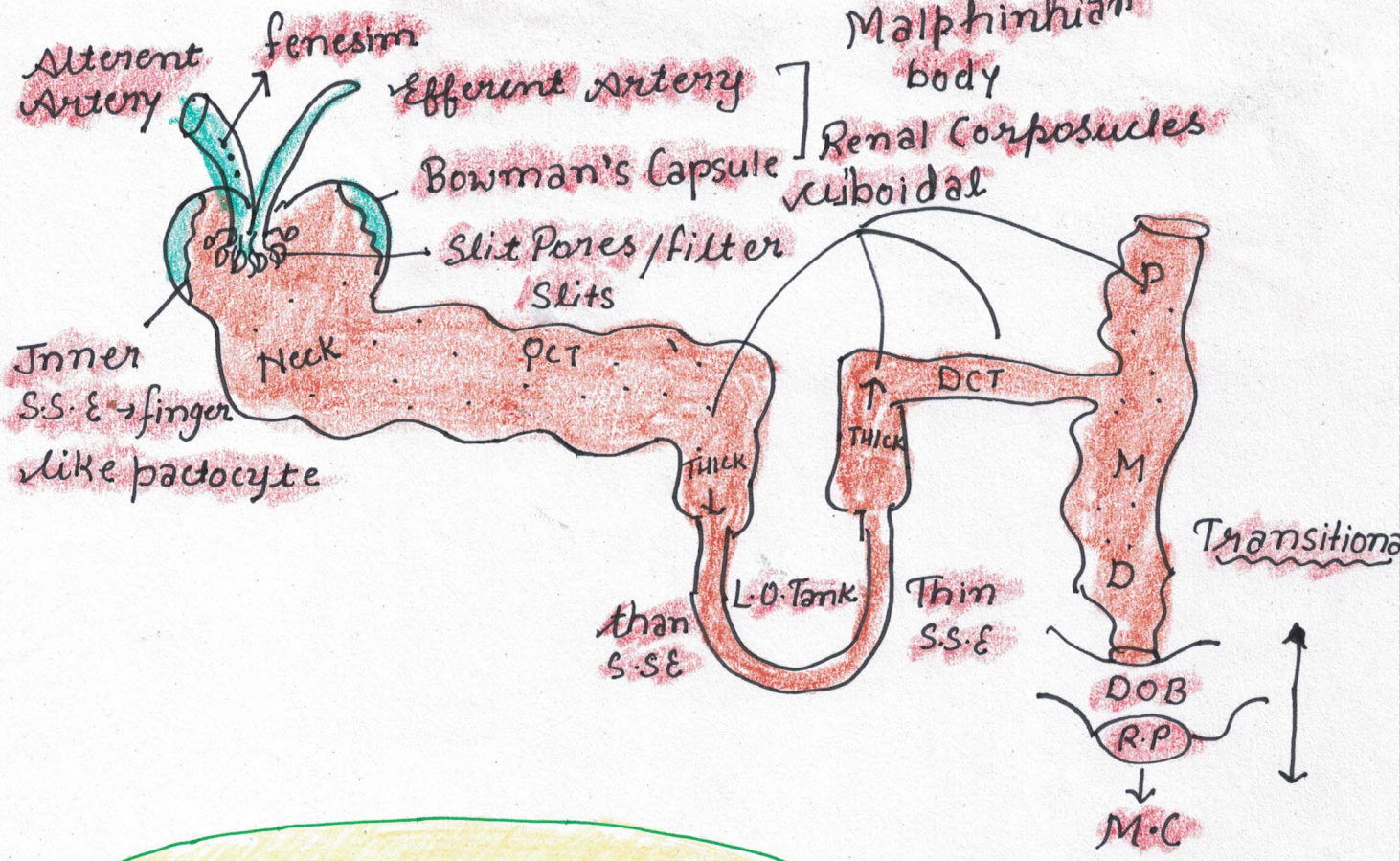
Urethera → urine pass out (Micturition)

Internal Structure of Kidney

Post Renal track, Mudurition Reflex.



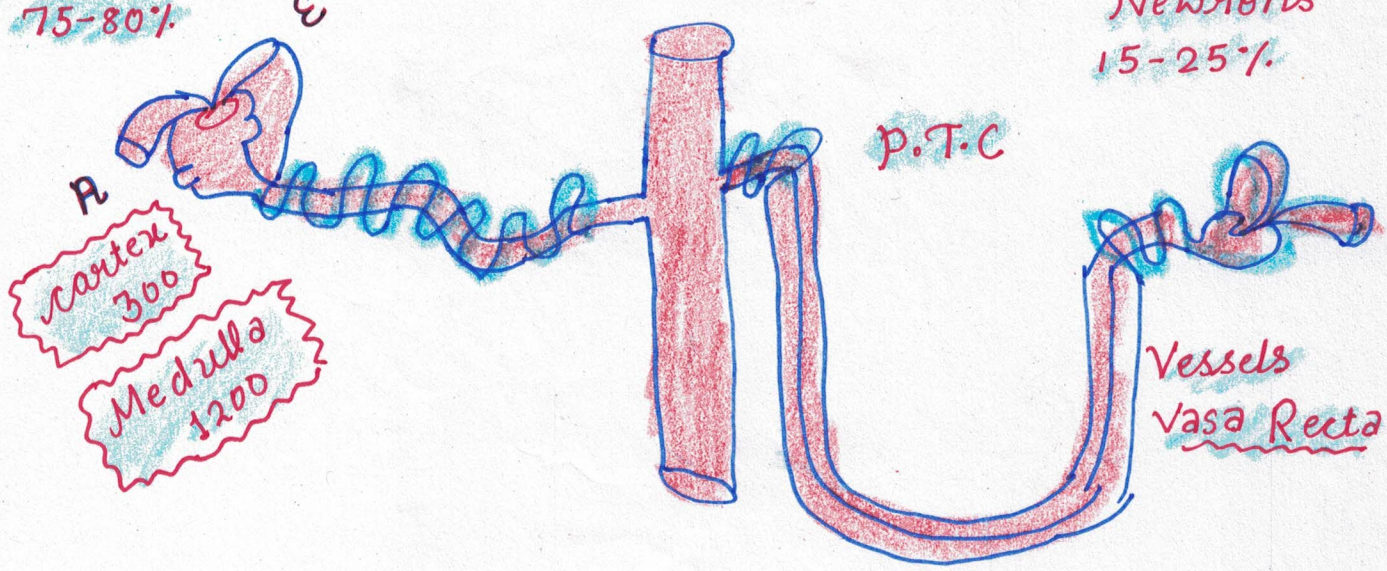
NEPHRON (STRUCTURAL AND FUNCTIONAL UNIT)



Types Of Nephrons

Cortial Nephrons
75-80%

Juxta Medullary Newrons
15-25%



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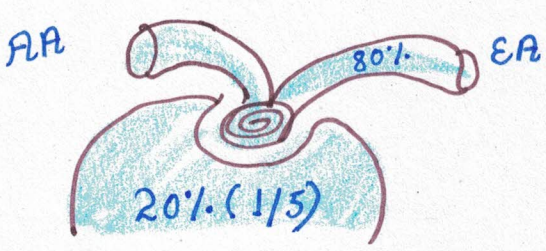
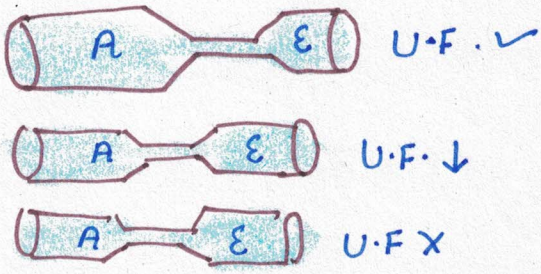
Mechanism of Urine formation :-

Ultrafiltration / Glomerular filterate

Non-Selective process :-





Filteration Membrane

- Epithelium (8 capsule) (SSE)
- Basement Membrane
- Endothelium (S.S.E).

Cardiac Output — 5000ml

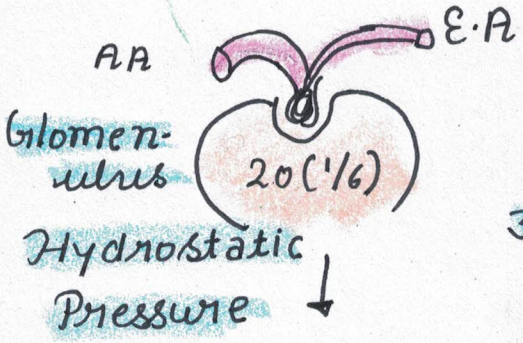
Kidney receive max. blood 20-25%. so its 1100 to 1200ml.

Renal plasma Flow (measure by Paraamino hepatic Acid) 650ml. (55% of 1200 ml).

Glomerular filtration Rate (measured by Incelin)

G.F. rate = 650 x 1/5 = 125 ml 1 min

= 180l per day



Hydrostatic Pressure ↓

B.C.op (Albumin 30mm of Hg)

↑

capsular Hydrostatic Pressure (C.H.P). 10-18 mm of H.g.

—

G.H.P = 60-75 mm of HG.

Effective filteration Pressure = GHP - (B.C.O.P + C.H.P)

= 10-15 mm of Hg.

Selective Tubular Reabsorption

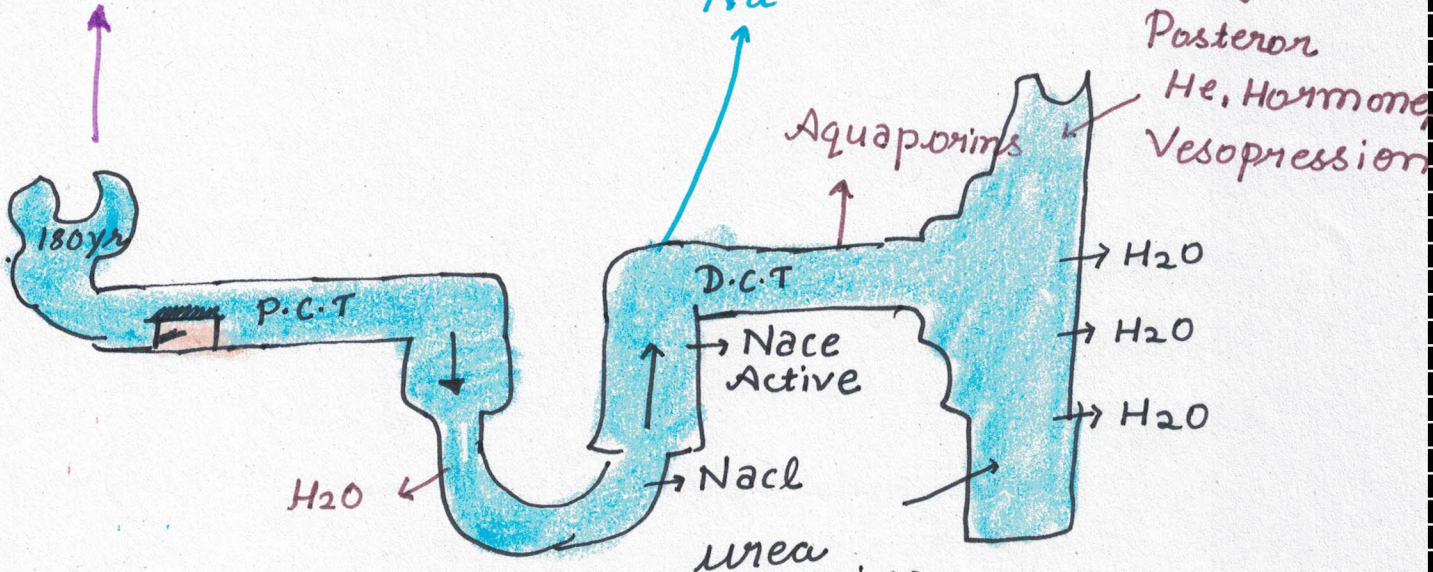
- Nearly 99% (179L) reabsorbs by renal tubules.
- Active and or passive process.
- Maximum Reabsorption → P.C.T
- Minimum Reabsorption → Ascending limb of loop of Henle.
- conditional Reabsorption → D.C.T
- Gluco, Ammino Acid, fatty acid and Nutrients (high threshold) → 100% and Actively.
- Cl^- and Urea (Nitrogenous waste) → (Low threshold) → passively.
- changable threshold → salt and water (Osmosis)

Insulin have 0% threshold Value (No reabsorption)

Max Reabsorvation
Brush Bondered cuboidal
Mitochandria ↑ (Energy ↑)
100% Gla, FA, AA, Nuh
70% to 80% , K+
70 - 80% H_2O

Salt Retaining harmone
Mineralcoticoids
(Zona glomerulasa)
(Adrenal Corkk)
Aldostenone
Na^+

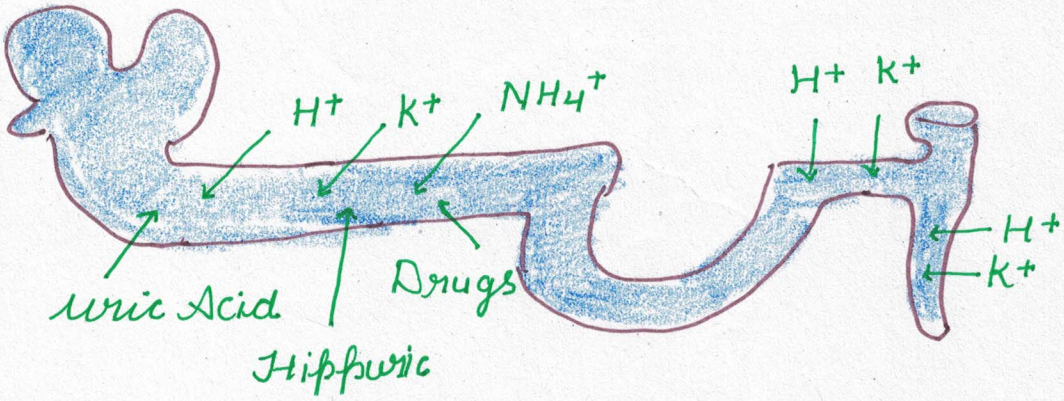
Hypothalanous
↓
Posteror
He, Hormone
Vesopression



Tubular Secreation

Active and Selective process occurs in tubular (PCTLD)

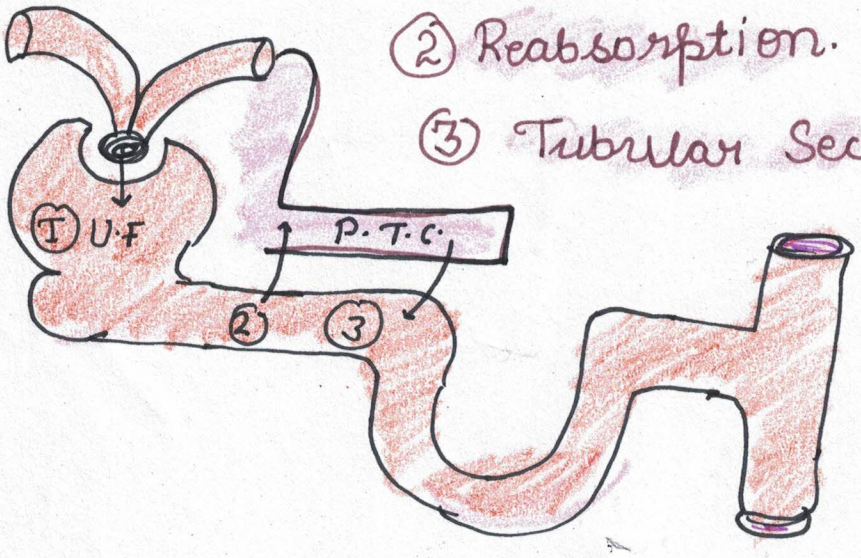
Maintain Ionic Balance apd pts.



① ultrafiltration.

② Reabsorption.

③ Tubular Secreation



Urine = Ultrafilteration (①) - Reabsorption (②) + Tubular Secration (③).

Composition of Urine

- 95% water + 2% electrolytes + 2.7% Urea + others.
  (others: creatin phosphate, Vitamic C, urine acid, hippuric acid, drugs)
- 1 to 1.5 l urine per day.
- 25 to 30 g urea per day.
- PH = 6 (acidic)
- Pale yellow because of urachrome and smell because of urinode.
- If person not taking dies → Less urea.
  carbohydrate > fat > Protein.

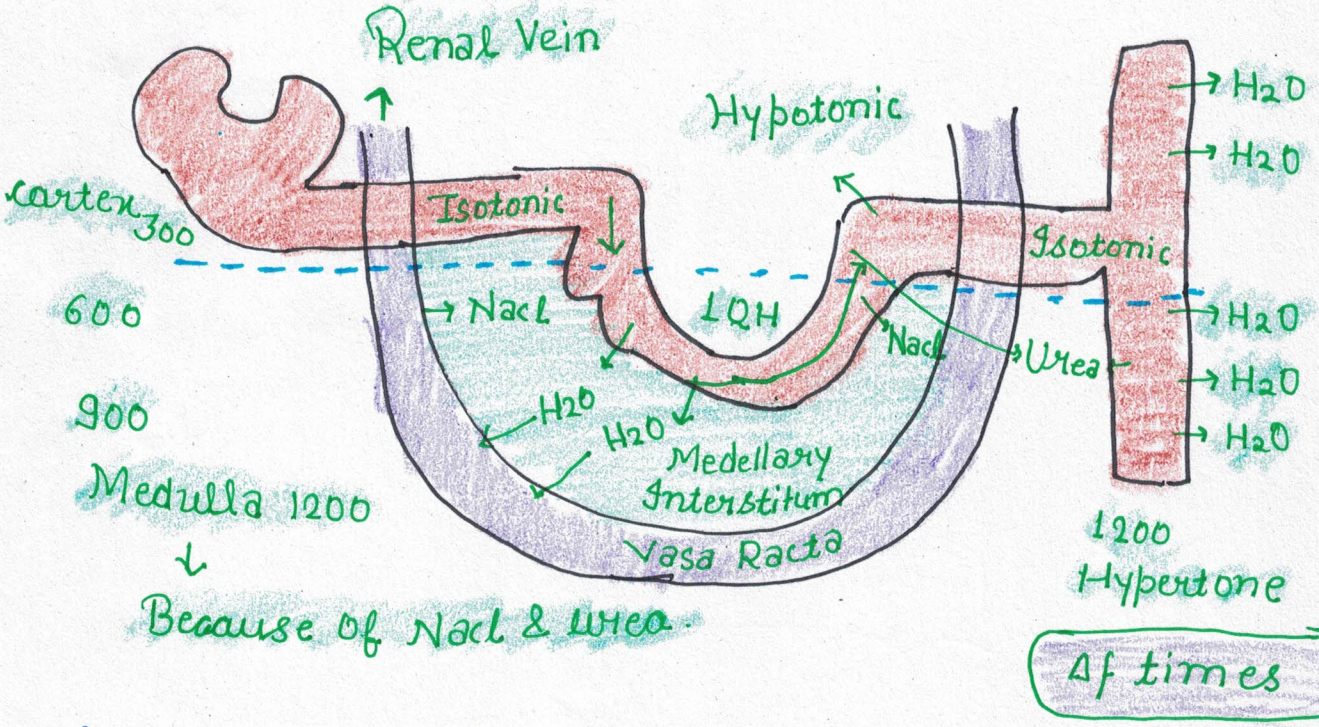
- If person taking more protaineous diet → more urea in urine.
- Metabolic wastage of protein → Ammonia, urea, CO_2.
- All the time of prolonged starvation and in Diabetis Mallietus → Keto urea (incomplete Oxidation of fat → Ketone in urine.

Mechanism of Concentration of the filterate

counter, current, Mechanism

↓ opposite , ↓ flow

- concentration of cortex → '300'
- concentration of Medulla → '1200'
- concentration Grodient maintained by Nacl and Urea.
- Loop of Henle and vasa recta play Important role.
- If we cut the loop of Henle, vasa recta, PCT → urine will be dilute.
- long Loop of Henle → more water conserved.



↓

Because of NaCl & Urea.

Regulation of Kidney function

- By ADH (Antidiuretic Hormone / Vasopressin)
- Synthesis in Hypothalamus.
- Released from posterior pituatary.
- Act as a Vesoconstrictor.

☞ Due to hyposecreation of ADH. mitrition rate increase polyurea condition known as diabetes insipidus

→ Diabetes insipidus
→ ADH↓
→ Glucose Absent in urine
→ Tasteless and dilute

↝ Diabetes Malletus
↝ Insulin↓
↝ Glucose present in urine → Glycosuria.
↝ Sweet & concentrated.

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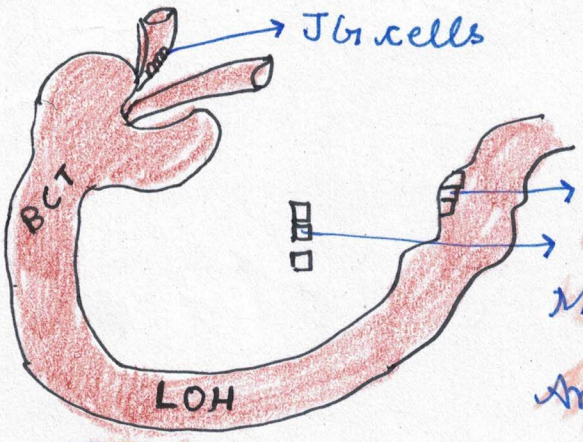
100d' volume ↓ → Osmoreceptors Activate → Posterfor Pituatory ADH → Reabsorption of H_2O

↑ Volume ← (Distal part of DCT. and collecting duct) / vasoconstriction

Juxta Glomerular Apparatus (JGA)



- Macula Densa
- Lacis / Palkissan
- Mesangial
- Angitensinoges → JGA → Renin (B.P↓) / Erythro (R.B.C)

↓ Renin (BP↓)
↓ J.G.A Activate
↓ Renin

↓ Angiostenin I (10AA)
↓ Angiostenin II (8AA)
→ Hypothalamus
→ Vasoconstrictor
→ Aldosterone → Reabsorption (Adernal contex of Na+

Anti Natriuretic Factor

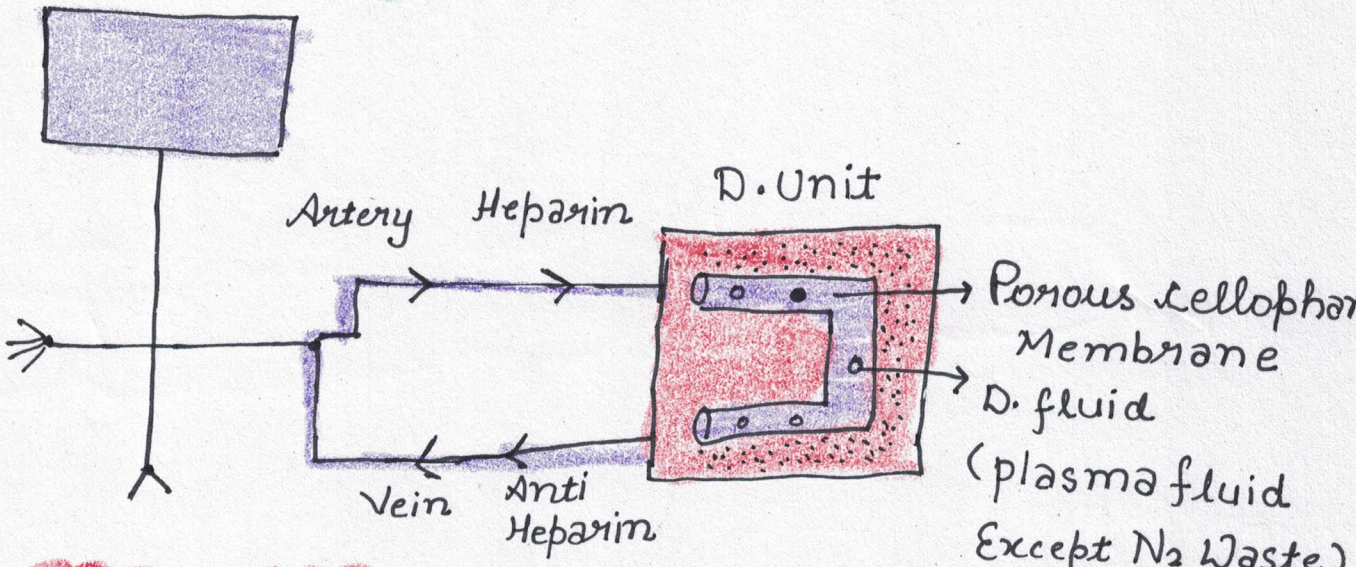
- BP↑ wall of Atria (heart) → Vasodilator → B.P.↓
- Inhibit the RAAS Mechanism.
- Excreation of Na+ Promotes

Role of Another Organ in Excreation

- Small Amount of urea present in Saliva.
- Every body of cell produce Excreatory material.
- Vacuole of Amoeba remove Excess of H_2O.

- Stratum Malphigi (Inner layer)
- Stratum Spongiosum
- Stratum Granulosa
- Stratum Lucidum.
- Stratum cornea (outer) Non-living.

Haemodilysis (Artificial Kidney)



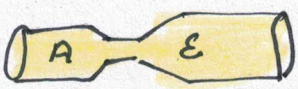
Auto-Regulation of GFR

- By JGA (Juxta glomerulus Apparatus)

GFR ↓ → JGA Activate → Renin → RAAS → B.P.↑ → G.P.R ↑.

- Myogenic Mechanism

GFR ↑ → contraction in smooth muscle of A.A → Diameter ↓ → Resistance ↑ → GFR ↓



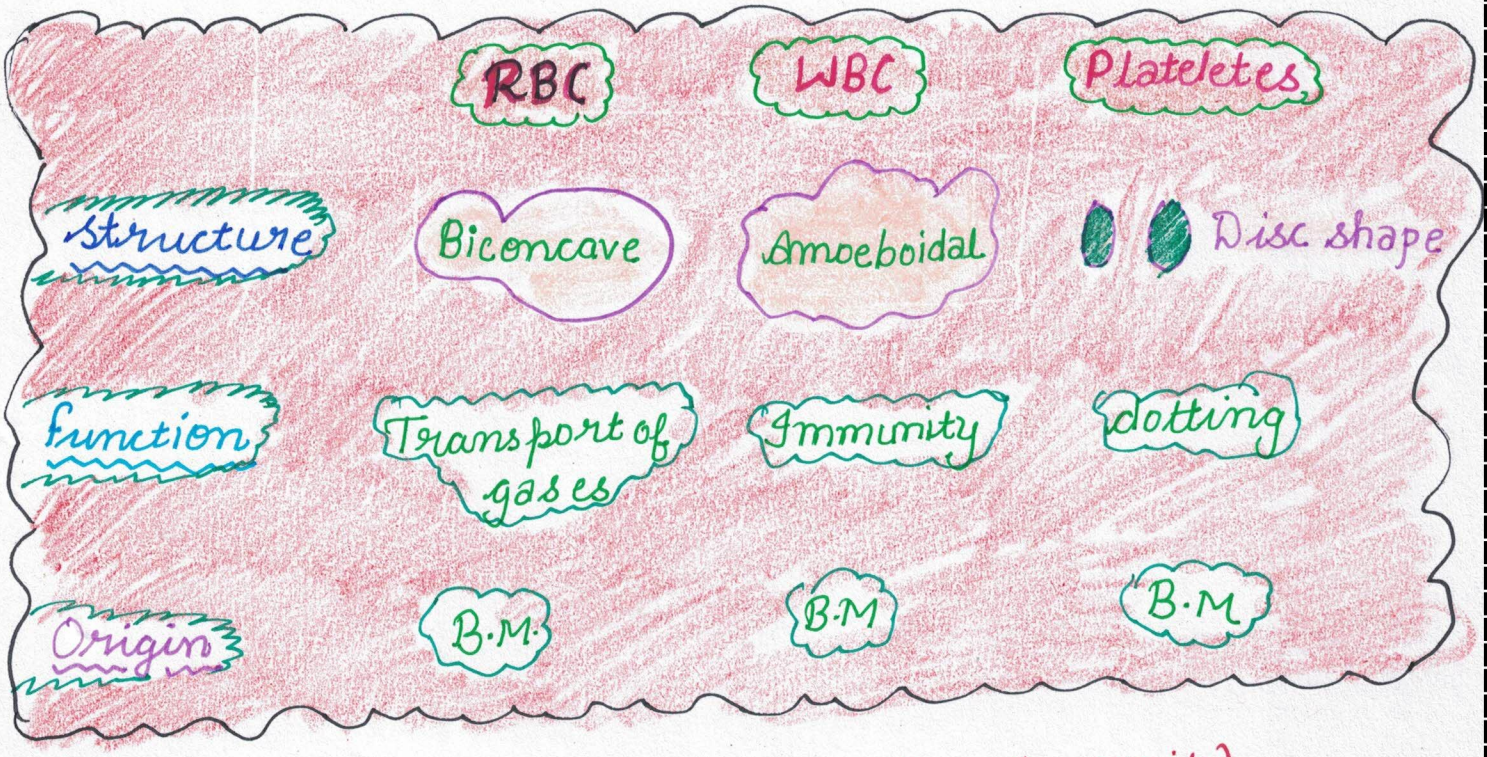
V.F.X

Animal Tissue

- Group of similar cells along with intercellular substances perform a specific function such organism known as tissue.

In a tissue cell may be dissimilar in structure and function but always similar in origin

Example: Blood.



cell (structure and functional unit)

↓ Division of labour

Group of cells (Tissue)

↓ Specific properties and pattern.

organ

↓ Physical and/or chemical Interaction

organ system

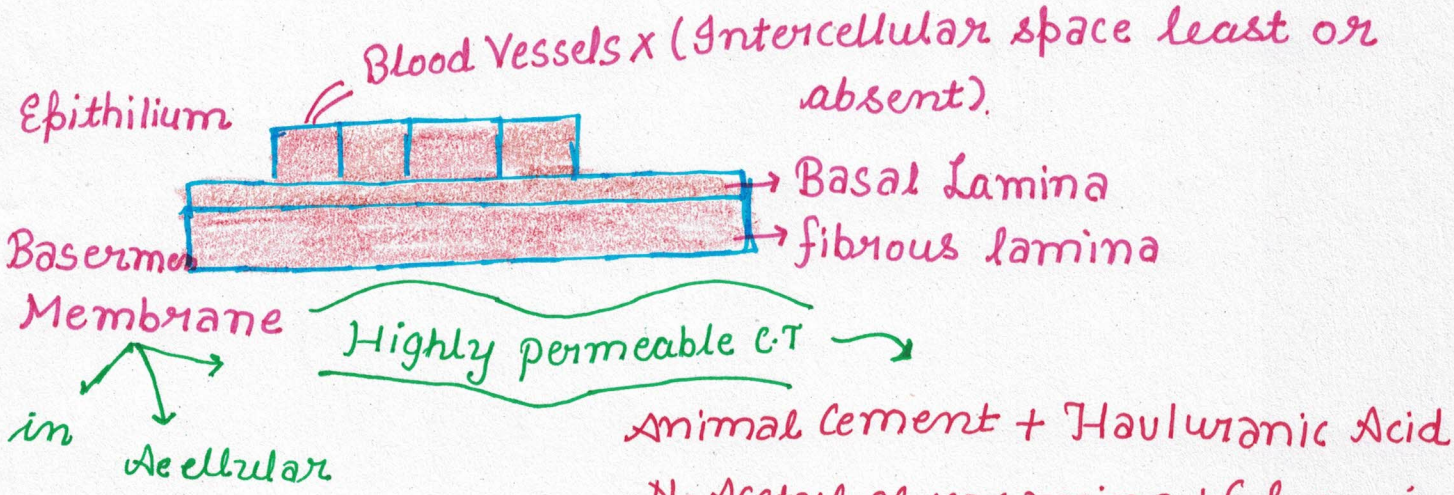
↓

organism.

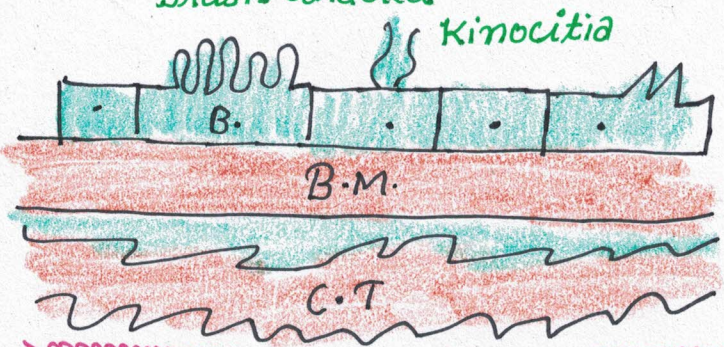
- Epithelium → Ecto/Meso/Endo
- connective tissue → Mesodermal
- Muscular tissue → Mesodermal. Except → iris, ciliary body Muscle.

Nervous tissue → Ecto (Except - Microglia)
↓
Mesodermal

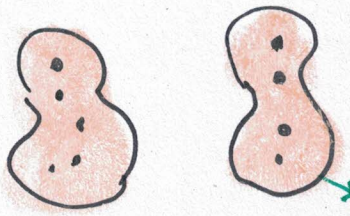
connective tissue → Also act as a insulator
(connect ligament) (Adipose).



Intestine
PCT ← P, I, G
F.T, EE, B
Brush Bordered
unidirectional → hollow
sterio Epidiohrynis
Vasa deferences



Cartilage and Bones

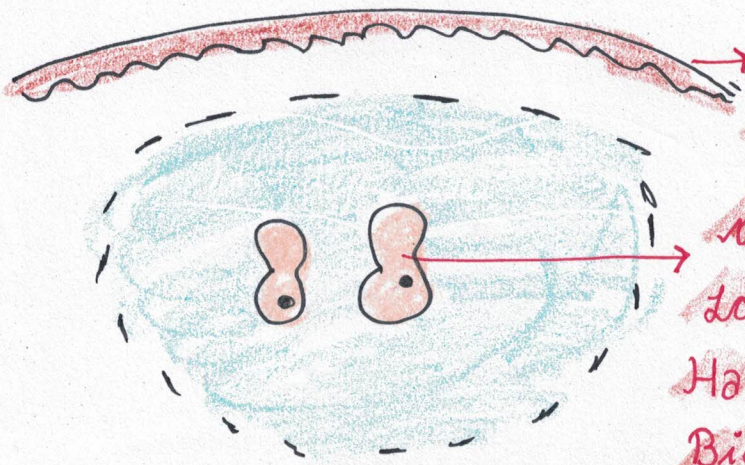


Mature
chondrocytes (1-4)
→ Lacuna
Solid

Matrix
Pliable

chondrin
↙ ↘
(-6-S HA

chondroclast (destroy)
Unidirectional



→ Periosteum
osteoblast

osteocytes (1)
Lacuna
Hard, Non Pliable
Bidirectional
Osteoclast

Matrix

Inorganic
65%

Organic
35%

$Ca_3(PO_4)_2$ (80%)

Ossein
(Sharpey's fibres)

Bone

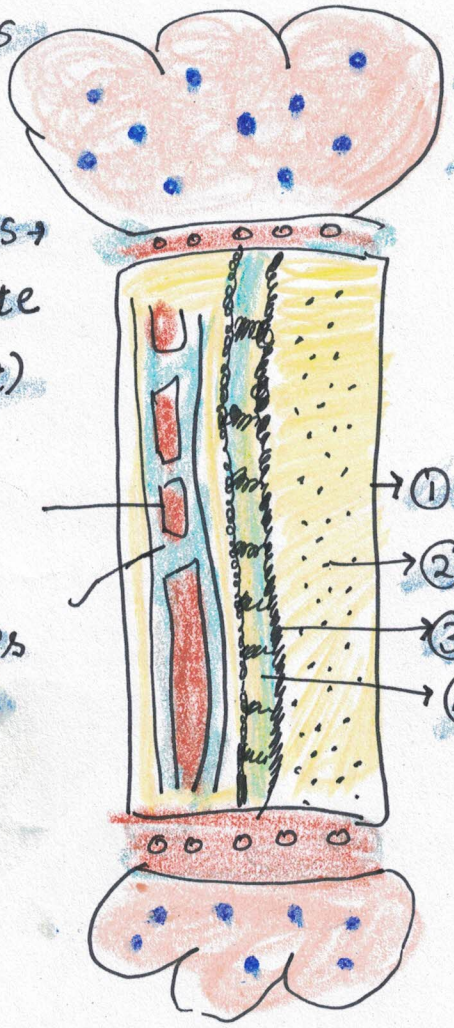
Spongy Epiphysis (Epiphysis)

Metaphysis → Epiphyged plate (osteddast)

Haversion Canal

Volkmann's canal

Diaphysis



Cavity Trebeculae → Myeloid Tissue (RBM) ↓ Haemopoietic organ

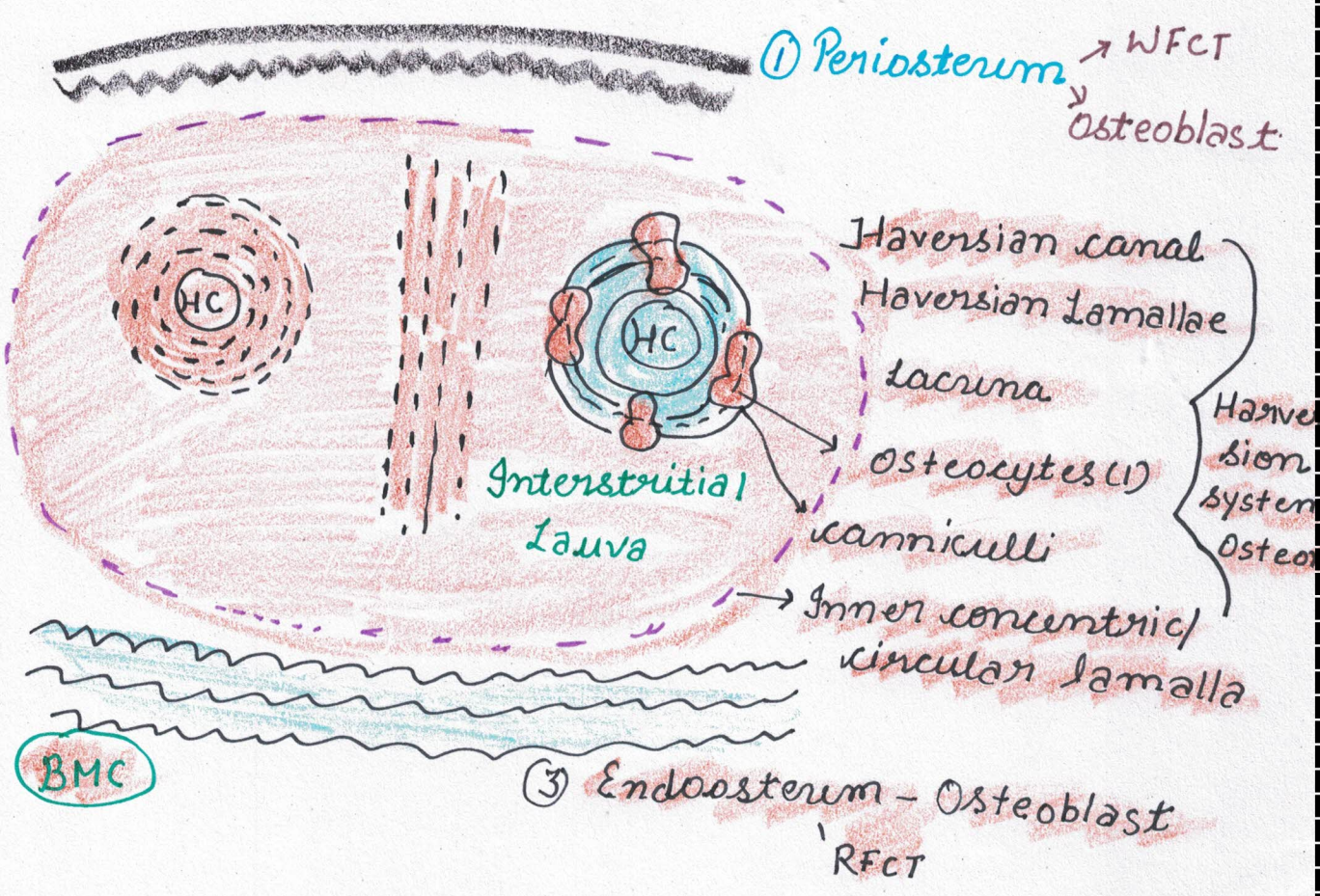
① P.O. (WFCT)

② Matrix (Lamallae)

③ Endoosteum

④ BMC (Bone Marrow Cavity)

(YBM → White fat)



- In case of Rabbit Lower Jaw is made up of Dentary bone.