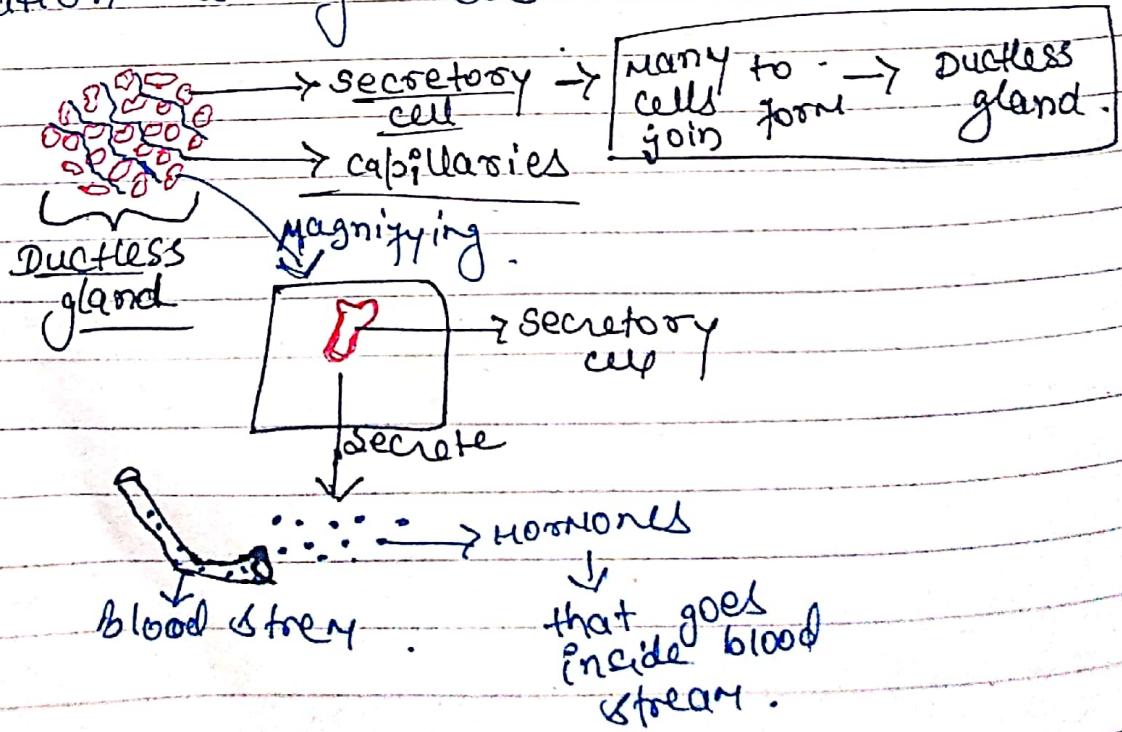


ENDOCRINE SYSTEM

- Endocrine system is a system of gland & these glands secretes types of hormones into the blood stream to regulate the blood.
 - It derives from greek word 'endo' means inside & 'crine' for secretes.
 - Endocrine system is an information signal system like the nervous system.
 - Endocrine system is made up of series of ductless gland that produces chemical called hormone.
- Hormones are substance released from endocrine tissue into blood stream that attached to the target tissue and allow communication among cells.



EXCRETION

→ Hormones :

- Hormones are the chemical messenger.
- Hormones are synthesised from amino acids and lipids (cholesterol based lipid need).
- Hormones formed in one gland or organ.

Then it goes to their target organ or tissue.

Then it produce cellular activity
(like growth & metabolism)

- In our body homeostasis is maintained by ANS & Endocrine System.

→ Pituitary Gland : ①

- It is located below the hypothalamus.
- It is "master endocrine gland" becoz they control all other endocrine gland.
- They play role on metabolism & regeneration.

→ Pineal gland (1)

- They play major role on sleep & awake cycle.

→ Parathyroid gland (4)

- They play role on absorption of Ca^{2+}

→ Thyroid gland (1)

- It regulate energy & metabolism

→ Thymus gland (1)

- It helps to builds resistance to disease

→ Adrenal gland (2)

- They present on the surface of kidney
- They secrete adrenaline or they regulate metabolic process, water balance maintain, B.P regulate.

→ Pancrease (1)

- They play major role in digestion of carbohydrates, proteins, fats.
- They synthesise insulin.

→ Ovary : (2)

- They make Estrogen & progesterone.

→ Testis : (1)

- They secretes Testosterone.

Classification of Hormone

→ A/c to chemical Nature :

- Steroids hormones -

eg ⇒ Testosterone, Estrogen, Progesterone.

- Amine Hormones -

eg ⇒ Epinephrine, norepinephrine.

- Peptide Hormone -

eg ⇒ Oxytocin & vasopressin.

- Glycoprotein Hormone -

eg ⇒ LH & FSH.

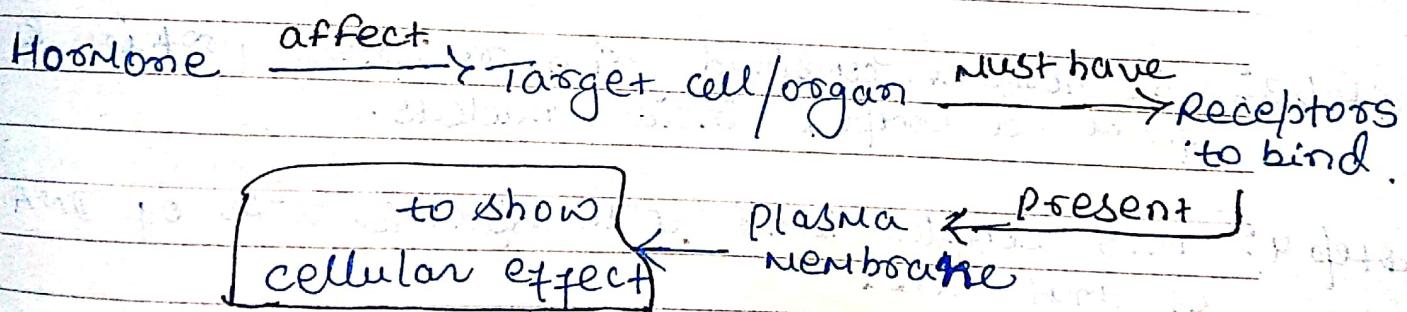
- Protein Hormone -

eg ⇒ Insulin & glycogen.

A/c to Nature of Action

- General Hormone -
eg \Rightarrow Thyroid & Insulin hormone they regulate release in our body.
- Specific Hormone -
 - The specific hormone is released only on certain condition. & they affect the function of specific organ.
eg \Rightarrow FSH & androgen.
 - Local Hormone -
eg \Rightarrow Prostaglandins, Histamine.

Mechanism of Hormone Action



- cellular effect
- change in membrane permeability.
- Synthesis of new protein or enzyme.
- Activation or inactivation of enzyme.

Mechanism of Hormone Action

↓
Direct gene activation
↓
for steroids hormones
(lipid soluble)
hormone

Second messenger system

↓
for (protein, peptides)
Non-steroids hormone

→ Direct gene Activation → for lipid soluble hormone
they cross plasma membrane easily.

Step 1° The steroids hormone enters in cell by diffusion.

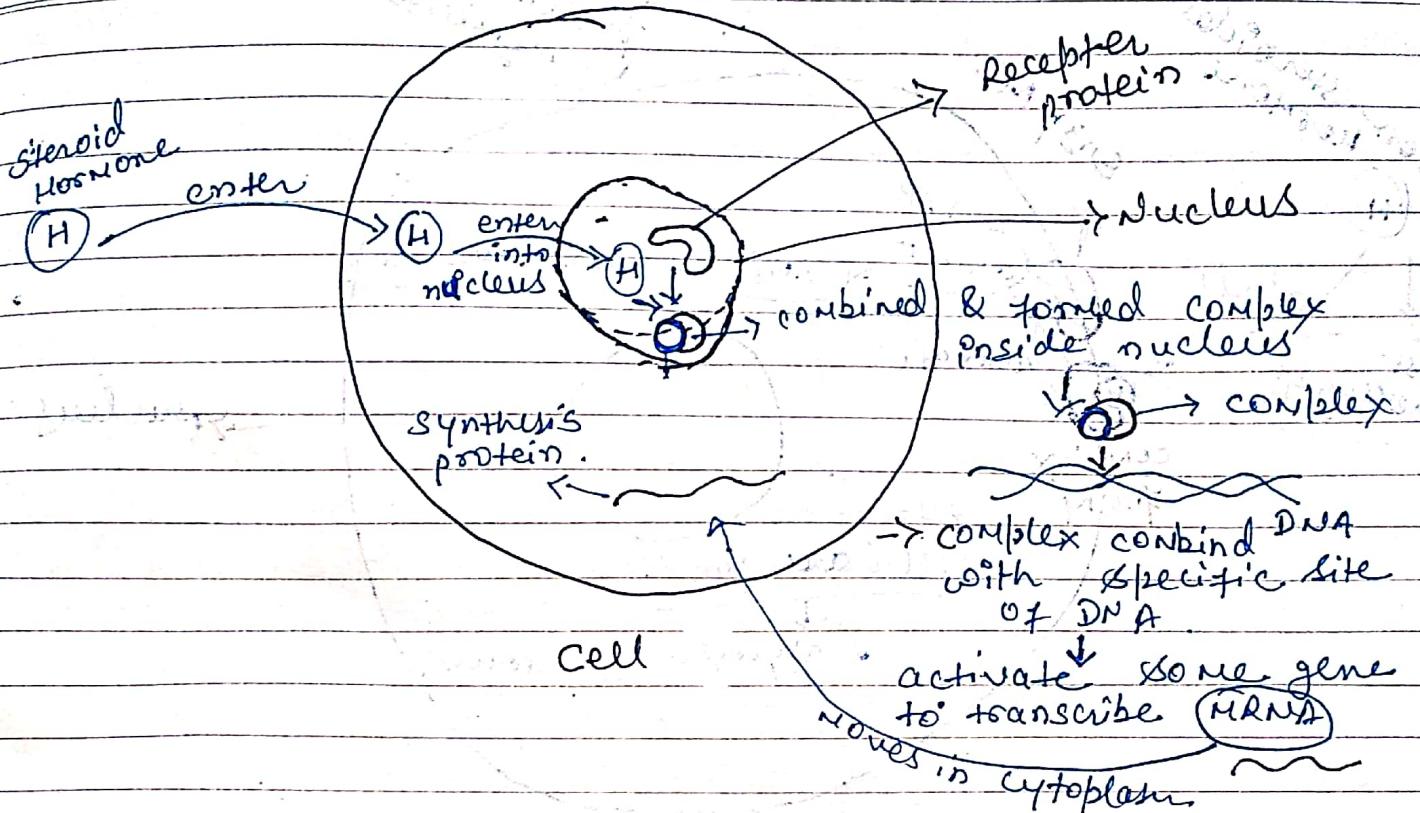
Step 2° This hormone enters into nucleus & In nucleus, they have receptor protein.

Step 3° The hormone combined with receptor protein & form a complex inside nucleus.

Step 4° This complex bind with specific site of DNA at that cell.

Step 5° After bind, the complex activates some genes of that DNA & that genes to transcribe mRNA (messenger RNA).

Step 6° mRNA then translated & translocated at cytoplasm & then translated to form new protein in plasma membrane.



→ Second messenger system

↳ only for water soluble hormone

- unable to enter target cell

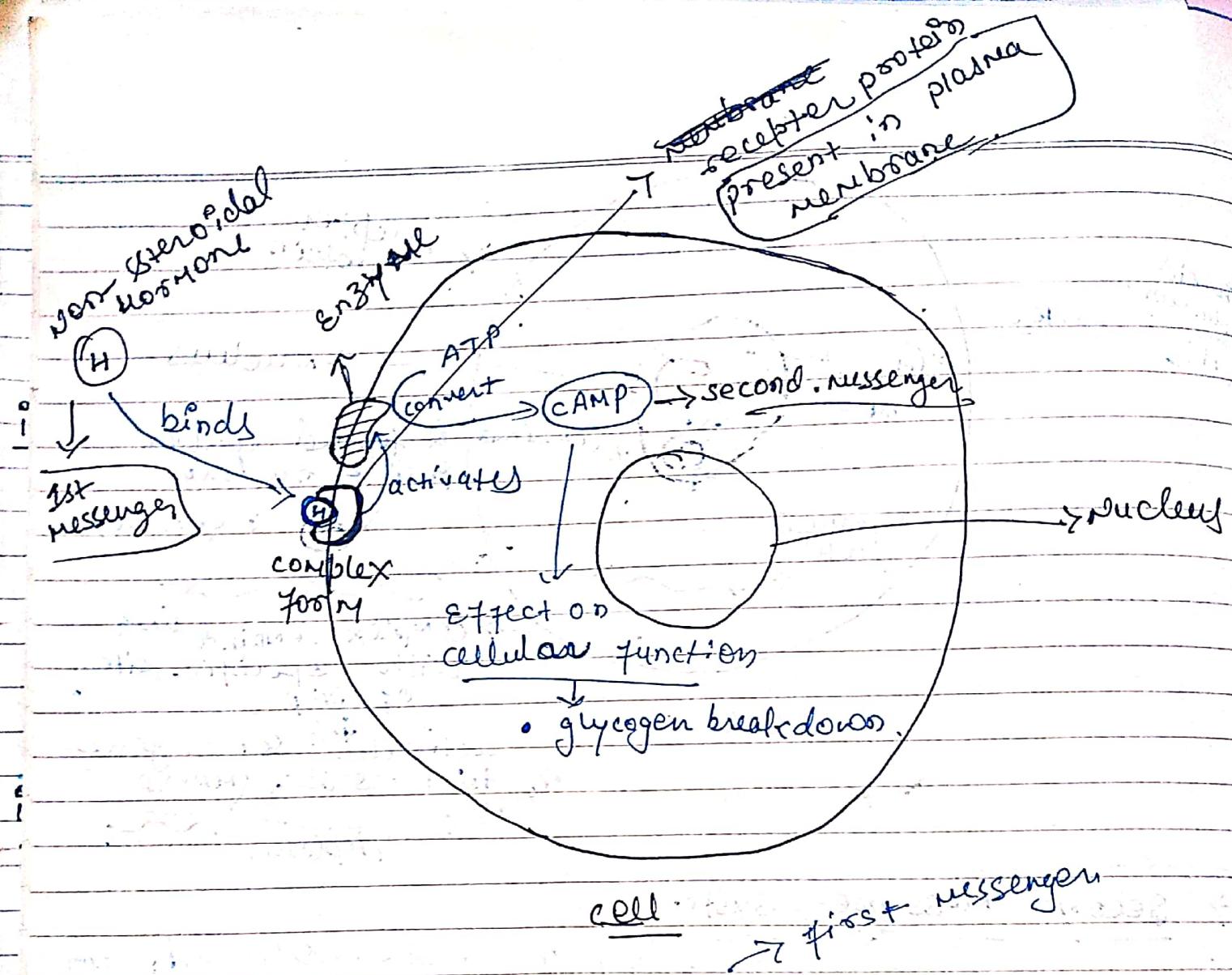
→ Second messenger system

- only for water soluble molecule,

- unable to enter target cell

• so, they binds with membrane receptor

- then the complex form & then utilize second messenger system.



Step 1: The non-steroidal hormone never enter in plasma membrane. So, they combined with receptor protein in plasma membrane & form complex

Step 2: This complex activates enzyme which is present on plasma membrane.

Step 3: Then that enzyme takes all ATP from cell & convert into cAMP.

↳ it is second messenger.

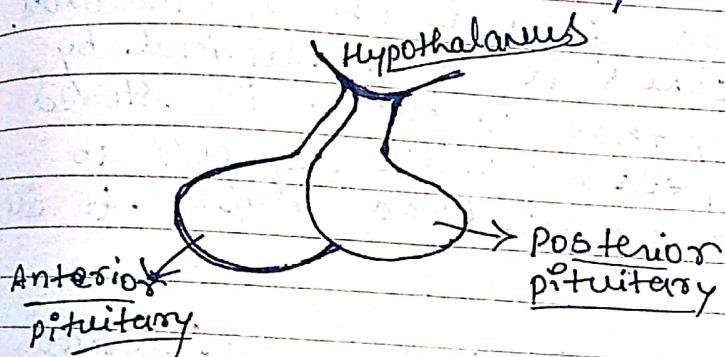
Step 4: This cAMP produce cellular function.

PITUITARY GLAND

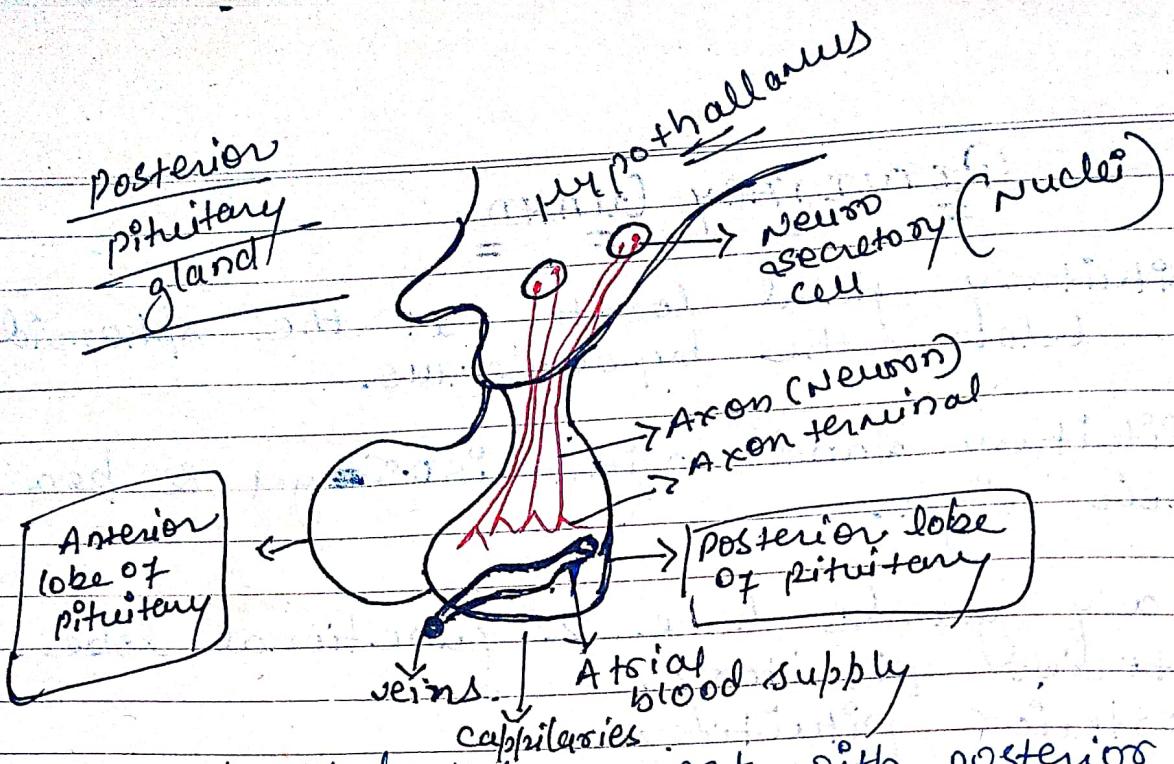
The pituitary gland locate at the sphenoid bone below the hypothalamus.

The Pituitary gland weight is 0.5 gm & less in their size.

- Pituitary glands have 2 functional lobe.
 - i) anterior pituitary
 - ii) posterior pituitary



- Anterior pituitary is made up of glandular tissue.
- Posterior pituitary is made up of nervous tissue.
- Pituitary gland controls activity of other gland so, that's why ~~the P+~~ is known as "master endocrine gland".
- Hypothalamus connected with anterior pituitary by ~~nerve secret fiber~~ blood circulation.
- Hypothalamus connected with posterior pituitary by nerve fiber.



so, the hypothalamus connect with posterior lobe of pituitary. The hormones formed in hypothalamus. So, that hormones comes to Axon terminal by passing Axon. & ~~they~~ that hormone is stored in the form of ~~vesicles~~ vesicles. & a/c to need they goes in atrial blood supply to our body.

∴ Hypothalamus general two hormones are formed

- i) ADH (Antidiuretic hormone)
 - acts in kidney tubles target.
- ii) oxytocin
 - acts on mammary glands.

Anterior pituitary gland

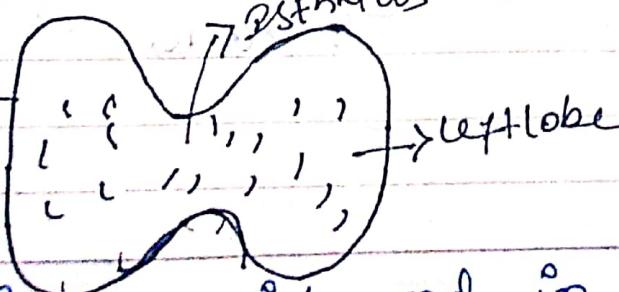
- It regulates several physiological processes including stress, growth & reproduction.
- Importance :-
 - control chemical & water balance in body.
 - control growth & metabolism

→ Hormones of anterior pituitary gland :-

	Target tissue
• GH	most tissue
• TSH	thyroid gland
• FSH	ovaries & testes
• LH	ovaries & testes

THYROID GLAND

- Thyroid gland is the largest gland in endocrine glands.
- It is butterfly in shape.
- It is located at below the larynx.
- Their weigh is about 15-20g.

- It consists of two lobes : right & left lobe.
right lobe ←  & they both separated by Isthmus.

- It is brownish red in colour & it is rich in blood vessels.

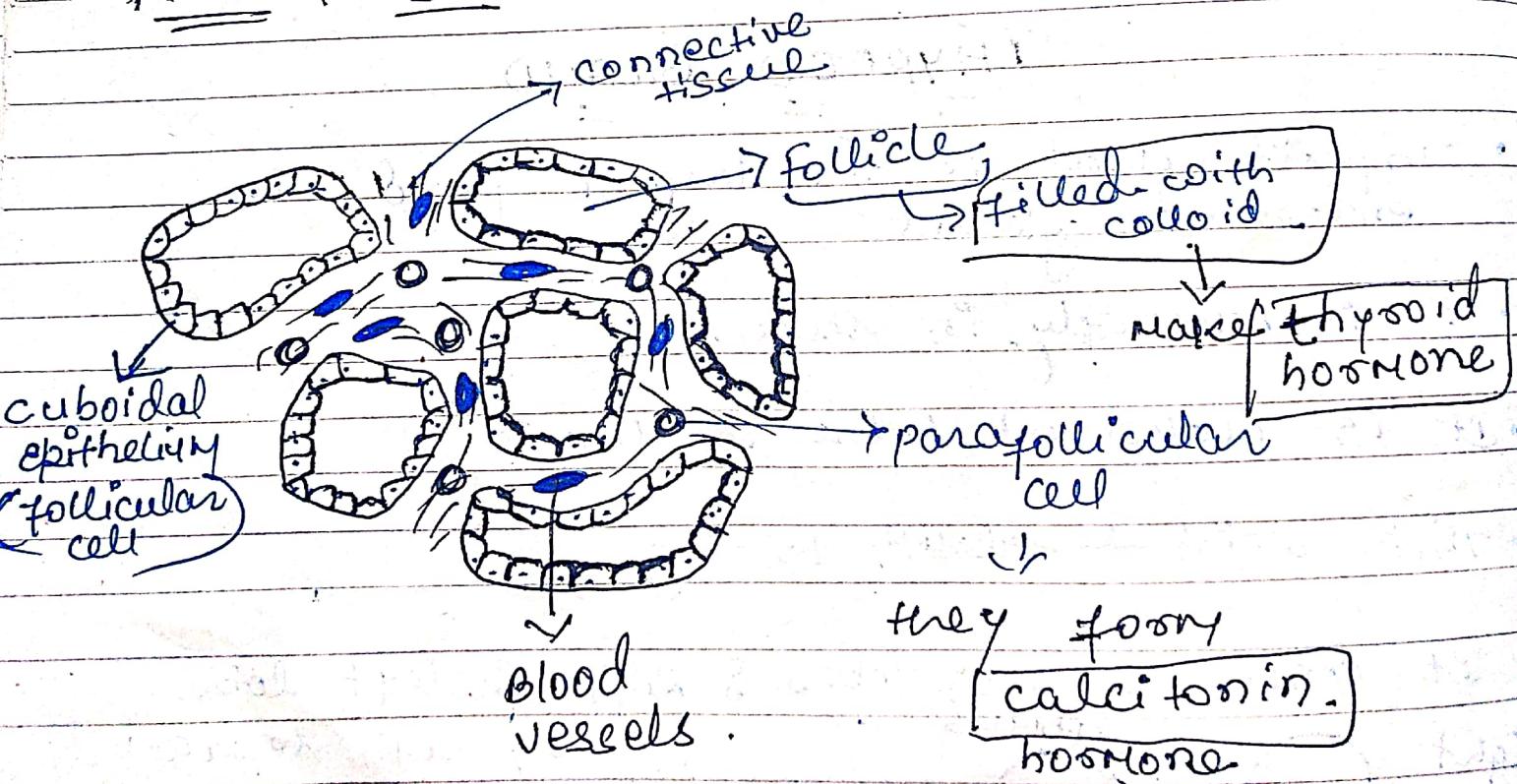
• Synthesis of thyroxine

→ Thyroid is composed of hollow structure called follicles (cavity)

they stored sticky colloids

derived thyroid hormone.

Microscopic Structure



→ Thyroid hormone :

- metabolic hormone
- present 2 tyrosine molecule.
- controls rate at which glucose is burned or oxidised.

↓
after then glucose convert
into body heat. → for body temp.

&
chemical energy. → Need each cell

→ Calcitonin hormone :

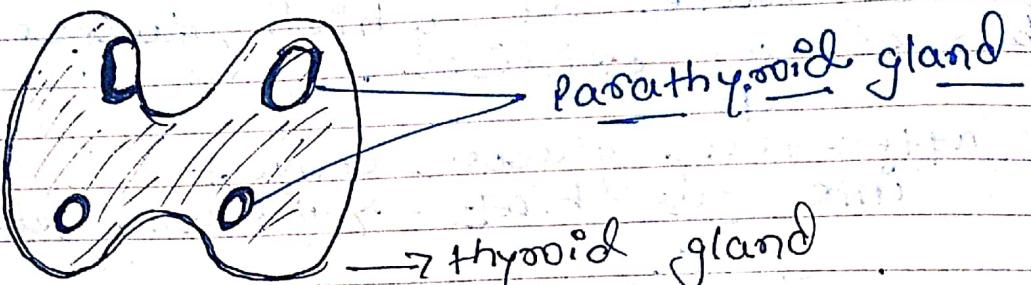
- they formed by parafollicular cell

- maintain Ca^{2+} & PO_4^{2-} level of blood
- if Ca^{2+} level is ↑
↓
they helps to ↓ Ca^{2+} level by depositing Ca^{2+} in bones from blood.

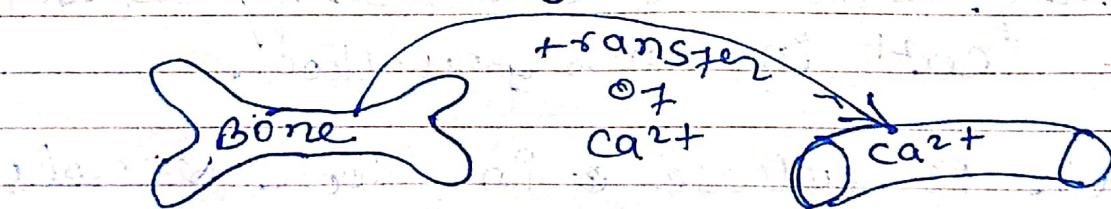
- calcitonin is release in blood vessels by parafollicular cell only during Ca^{2+} level is high.

II Parathyroid Gland

- composed of glandular tissue.



- located at back side on the surface of thyroid gland.
- It also stimulate kidney & intestine to absorb more Ca^{2+} .
- It shows hypercalcemic effect (they takes Ca^{2+} from bones & transfer to blood stream. So, in blood the $\text{Ca}^{2+} \uparrow\uparrow$ (high)).



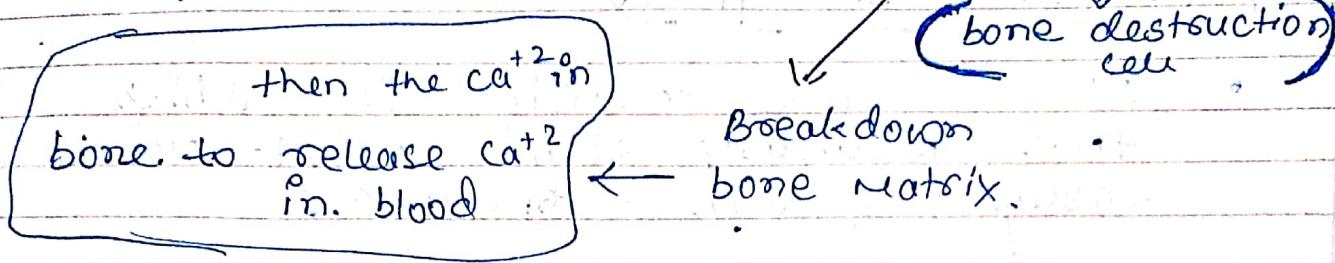
→ Parathyroid gland

[secretes]

Parathyroid hormone (PTH)

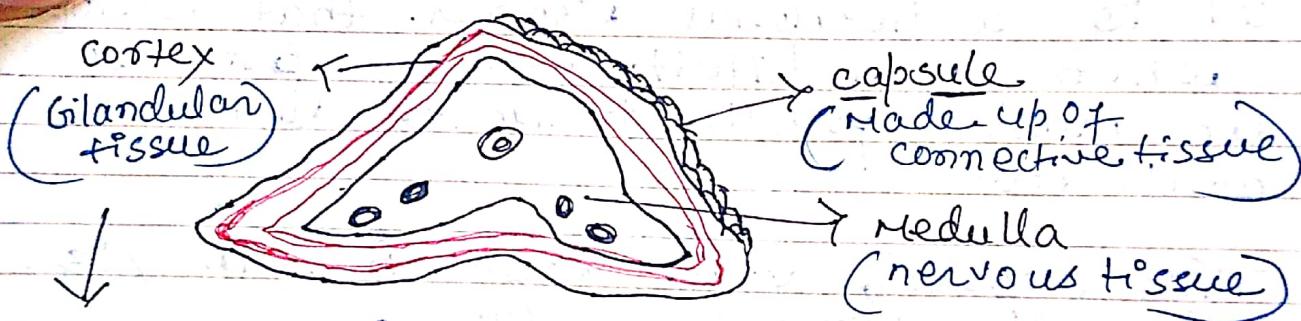
↓
regulate blood Ca^{2+} level.

when $\sqrt{Ca^{2+}}$ level \rightarrow PTH release \rightarrow stimulate osteoblast,



II Adrenal Gland/Medulla/Cortex

- It is bean shaped on top of kidney & two in numbers.



\rightarrow Adrenal cortex ~~is~~ have three layers & it is made up of glandular cell.

\rightarrow Adrenal medulla is made up of nervous tissue.

- It gets stimulated by S.N./sympathetic nervous system then they release hormone called Epinephrine & nor-epinephrine

\uparrow Heart rate \leftarrow helps to prolong the effect

\uparrow Blood press \leftarrow helps to prolong the effect

\uparrow Blood glucose \leftarrow neurotransmitter of SNS.

level

Disorder of Pituitary gland

i) Pituitary Dwarfism

- It is the condition in which the pituitary gland doesn't make enough growth hormone.
- This results in a child's their height is below to normal height due to deficiency of growth hormone.

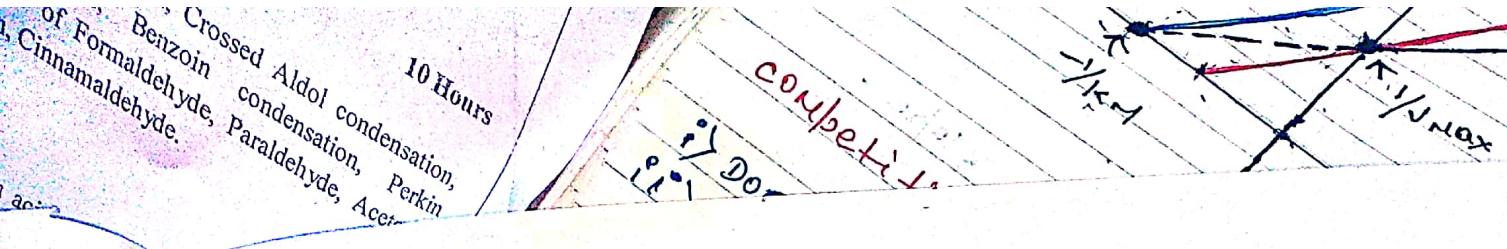
ii) Acromegaly

- It is a hormonal disorder that develops when your pituitary gland produces too much growth hormone during adulthood.
- This results, your bones inc. in size including your hand, face,

Disorder of Thyroid Gland

→ Hyperthyroidism "Grave disease"

It is an autoimmune disorder is the most common cause of hyperthyroidism. It causes antibodies to stimulate the thyroid to secrete too much hormone.



Hypothyroidism or 'Goitre'

It is a swelling in the neck resulting from an enlarged thyroid gland. The term is also used to describe an enlarged thyroid.

Disorder of Parathyroid Gland

i) Hypoparathyroidism

- It is the condition in which decrease secretion of parathyroid hormone.
- This leads to the decrease blood level of Ca^{+2} (hypocalcemia)

ii) Hyperparathyroidism

- It is the condition in which increase secretion of parathyroid hormone.
- This leads to the inc. Ca^{+2} level in blood (hypercalcemia).