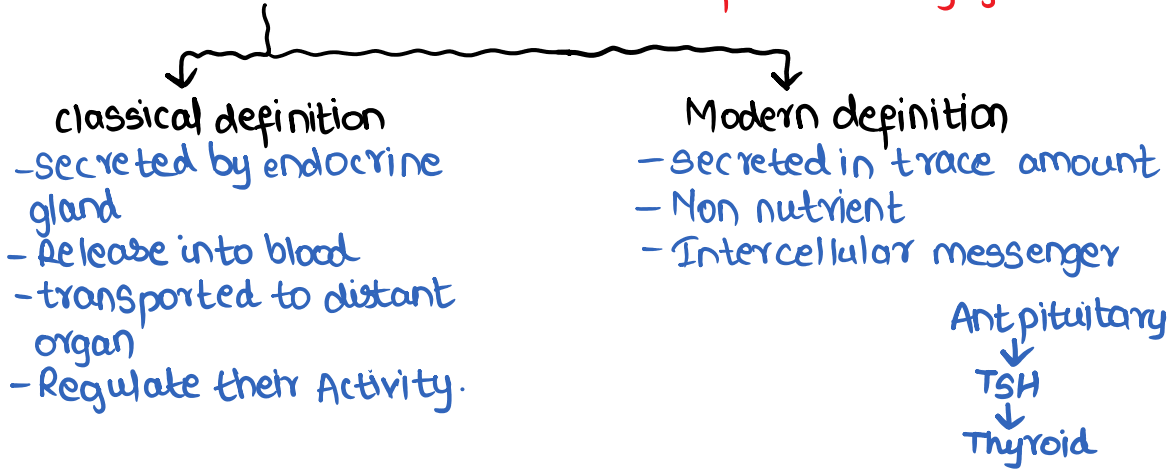


# CHEMICAL COORDINATION & INTEGRATION

Hormones: are released into fluid bathing gland



# Difference b/w Nervous & Endocrine System:-

- |  |   |
|--|---|
| <p>↓</p> <ol style="list-style-type: none"><li>1. Electrical impulses</li><li>2. has direct connection with every part under its control.</li><li>3. Transmission Rapid</li><li>4. Response is quick</li><li>5. Localised effect</li><li>6. Short duration</li></ol> | <p>↓</p> <ol style="list-style-type: none"><li>1. chemicals called hormones</li><li>2. is not directly connected with part under its control</li><li>3. slower</li><li>4. Response is slow</li><li>5. widespread effect</li><li>6. longer duration.</li></ol> |
|--|---|

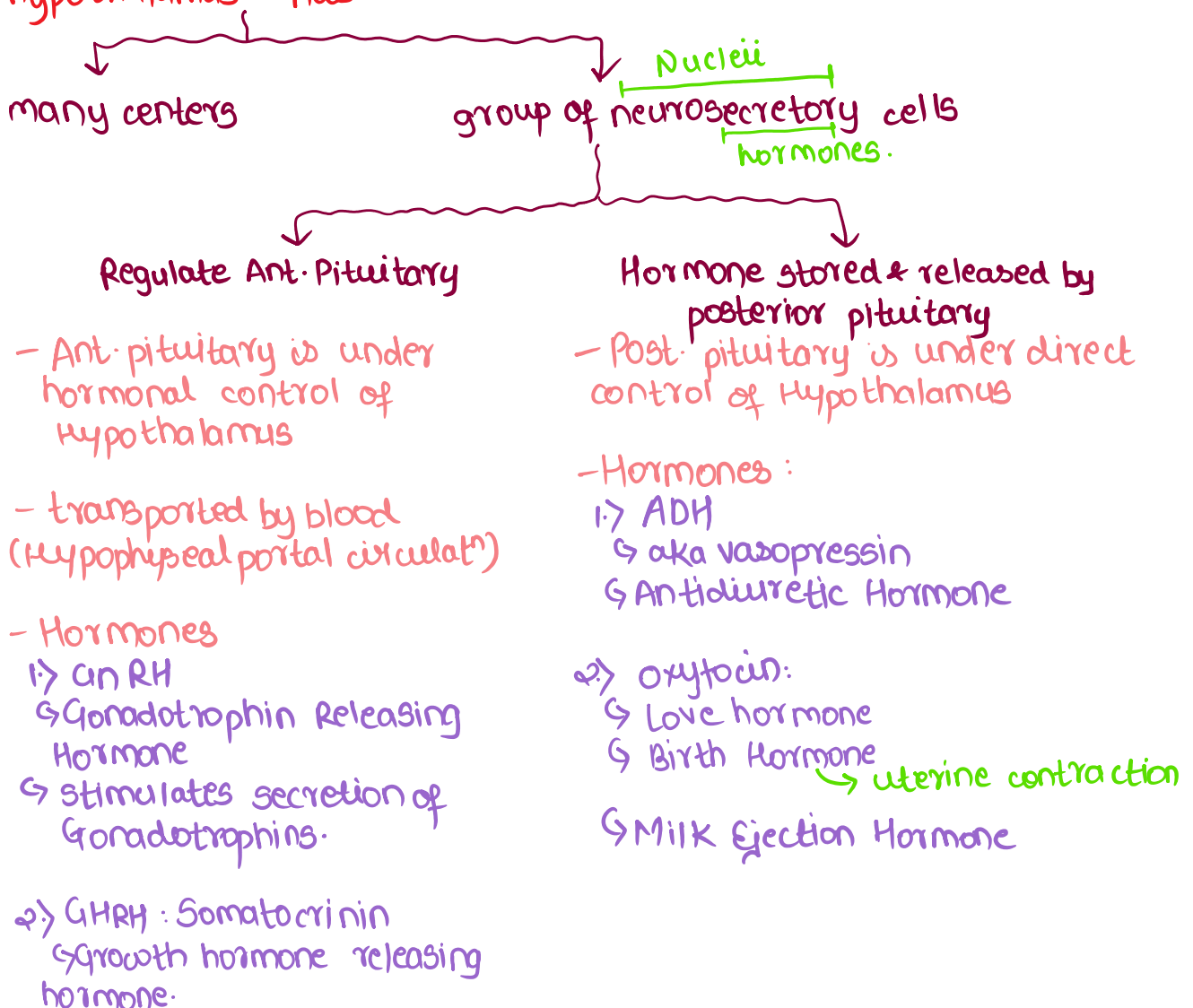
# Types of glands:

- 1) Exocrine Gland: secretion is through duct
- 2) Endocrine Gland: ductless gland

- a) Endocrine secretion: target organ is distant
- b) Paracrine secretion: act on cell in near vicinity
- c) Autocrine secretion: acts on same cell which secrete it

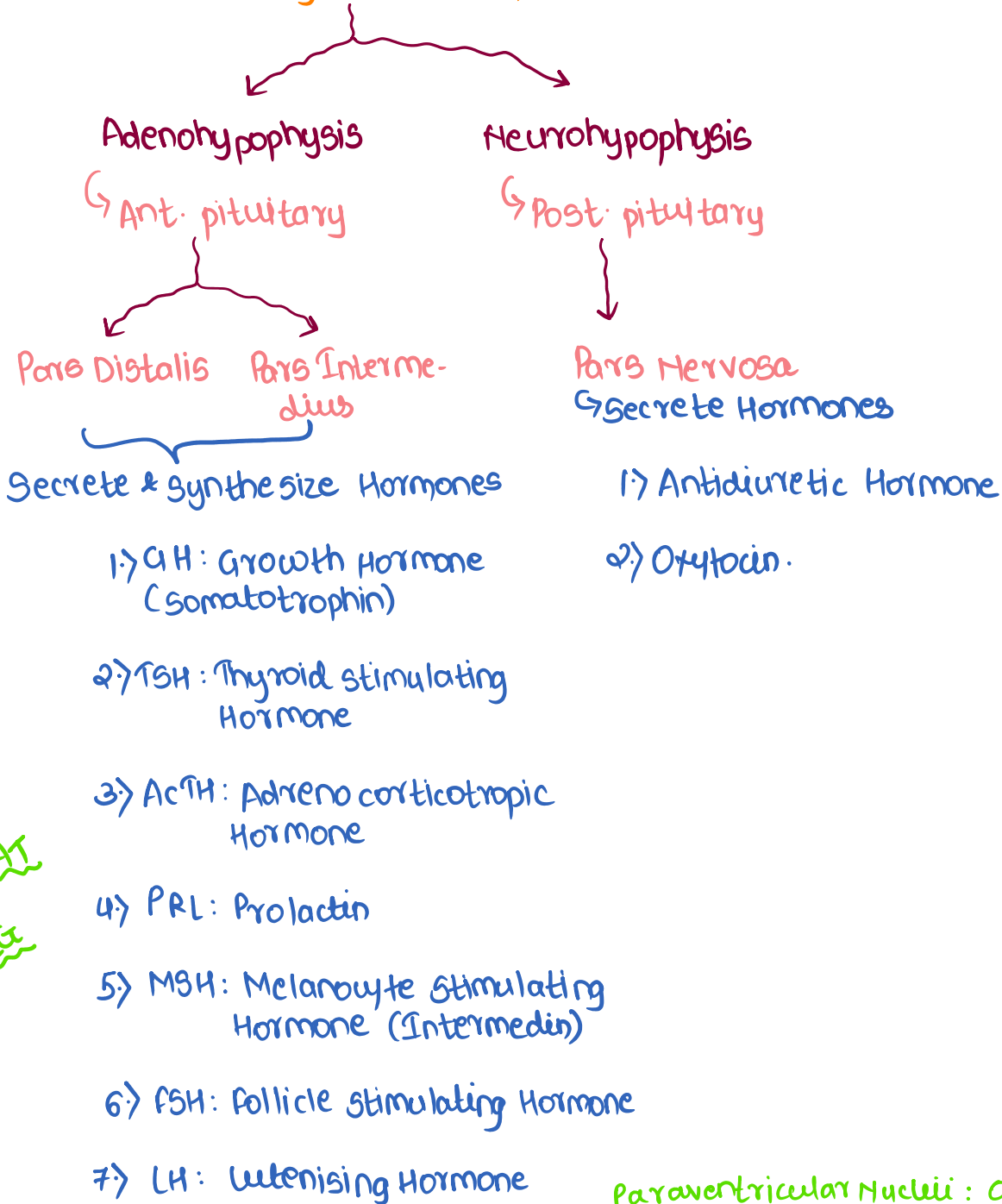
## # HYPOTHALAMUS:-

- ↳ located at basal part of diencephalon
- ↳ Master of Master Gland.
- ↳ Acts as connecting link b/w nervous & endocrine system
- ↳ hypothalamus has



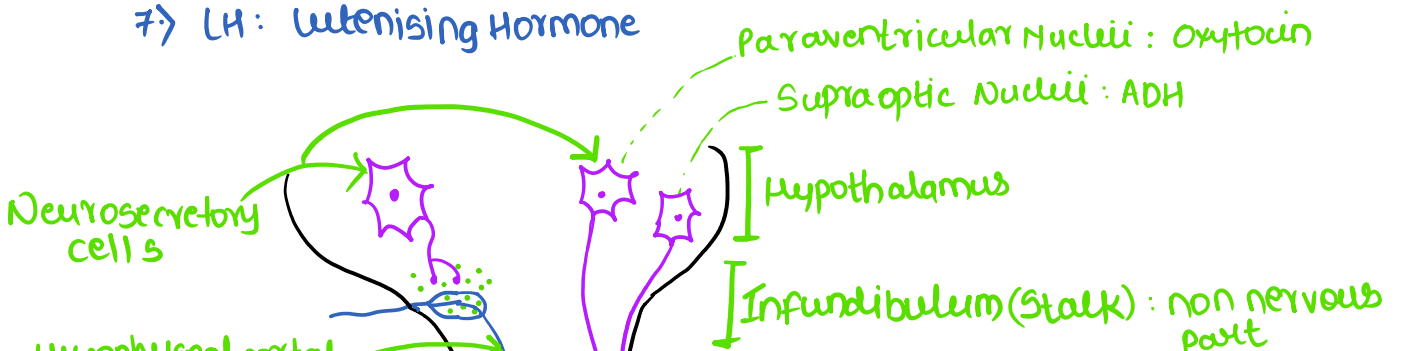
# # PITUITARY GLAND:-

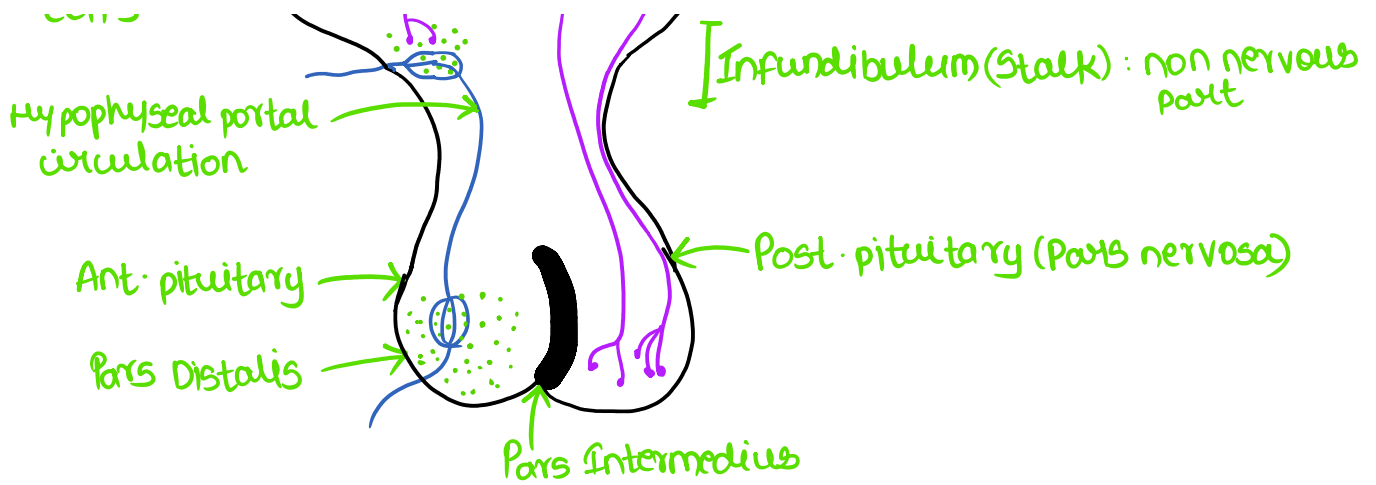
1. located in sella turcica: sphenoid bone
2. aka Hypophysis / Hypophysis cerebrii
3. Anatomically divided into



FLAT

PIG





- ★ NOTE: 5 types of cells are found in Pars distalis
- ↳ Somatotroph
  - ↳ Thyrotroph
  - ↳ Corticotroph
  - ↳ Lactotroph
  - ↳ Gonadotroph

- Growth Hormone:
  - ↳ Growth (types)
    - ↳ Physical: GH → Elongation of Bone  
Protein synthesis ↑  
Lipolysis.
    - ↳ Mental } No impact
    - ↳ Sexual } No impact

↳ Disorders:

a) Hyposecretion: Pituitary Dwarfism (Midgets of circus)

b) Hypersecretion: 1) Gigantism: Hypersecretion during growth  
Excessive, abnormal growth  
proportionate growth

2) Acromegaly: Hypersecretion during middle age

Hard to diagnose at early stage  
Abnormal growth especially  
face (lower jaw), palm, sole  
Serious complication, premature  
death

● TSH: Thyroid Stimulating Hormones

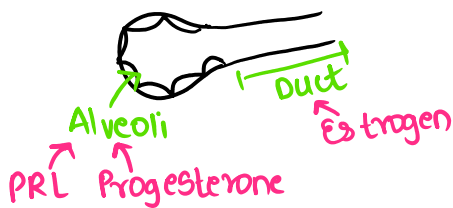
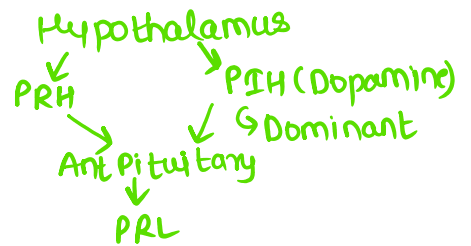
↓ acts on  
Thyroid follicles  
T<sub>3</sub> T<sub>4</sub> : Growth of thyroid glands.

● **ACTH: Adrenocorticotrophic Hormone:**

↳ Adrenal Cortex : Glucocorticoid (Cortisol)  
↳ No effect on Mineralocorticoid (Aldosterone)  
↳ Regulated by RAAS

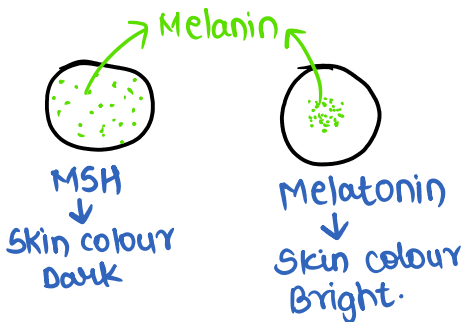
● **PRL: Prolactin Hormone:**

↳ Growth of mammary gland  
↳ Secretion of milk



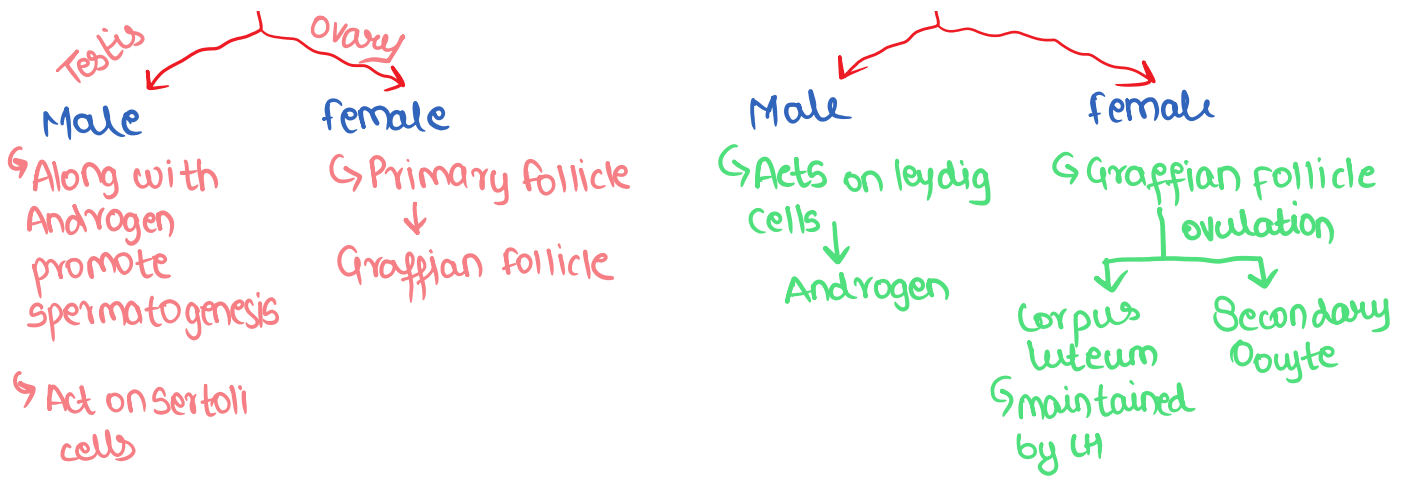
● **MSH: Melanocyte Secreting Hormone**

↳ Acts on melanocyte  
↳ melanin pigment  
↳ Darkness of skin



● **Gonadotropins:**



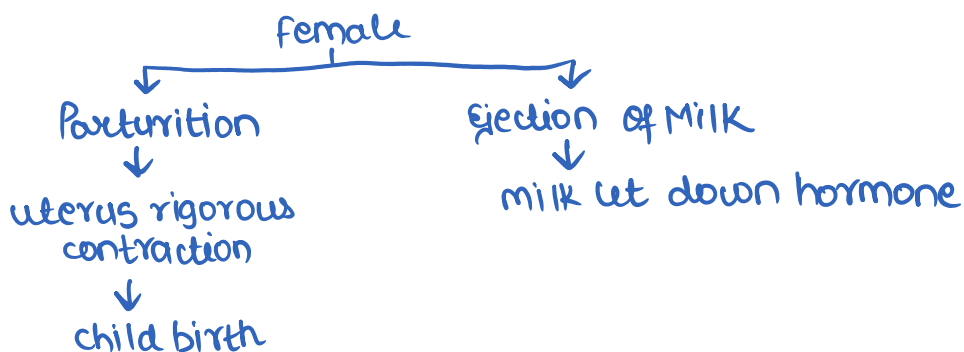


● **ADH / Vasopressin:**

- ↓
- Resorption of electrolytes, Water from later parts of nephron  
(Asc. LH) (DCT, CD)
- Vasoconstrictor: ↑ BP
- Disease: If ↓ ADH secretion
  - ↓
  - Reabsorption of water ↓
  - ↓
  - ↑↑ urine volume
- deficiency cause: Diabetes Insipidus

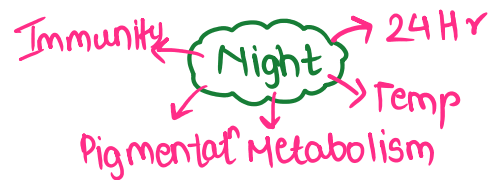
● **Oxytocin:**

- Act on smooth muscle: contraction



## # PINEAL GLAND:

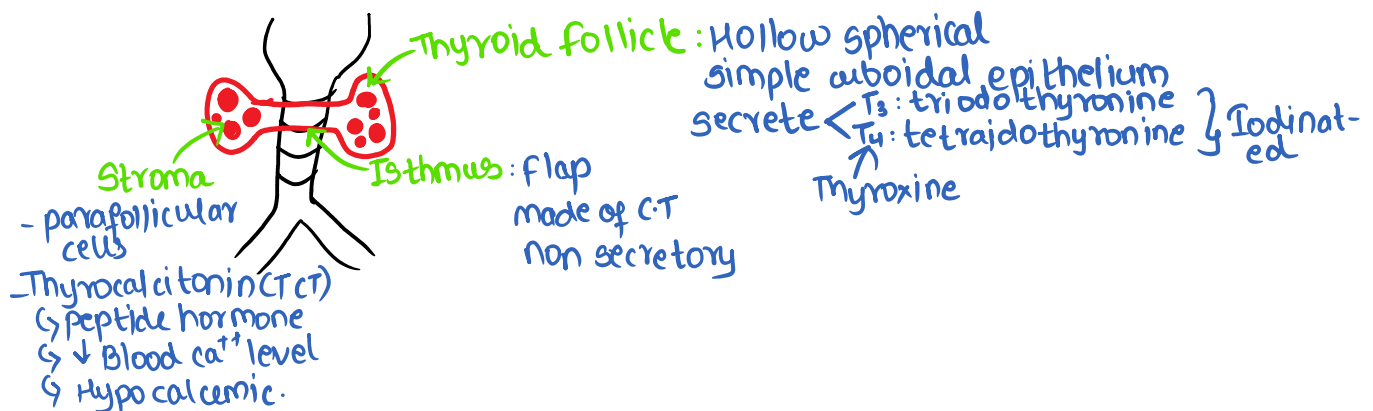
1. Dorsal side of fore brain (Roof of third ventricle)
2. Hormone : MELATONIN (amino acid derivative)
3. Regulates 24 Hr cycle [Diurnal rhythm/ circadian rhythm]
  - Body temp ↓↓
  - Metabolism ↓
  - Defence Capability (Immunity) ↑
  - Pigmentation ↓
  - Menstrual cycle ↓



- Antigonadal  
↳ menstrual cycle

## # Thyroid gland:

- largest endocrine gland
- Bilobed on either side of trachea



- Functions: T<sub>3</sub> & T<sub>4</sub>: Similar function: ↑ Activity: T<sub>3</sub>  
↑ secretion: T<sub>4</sub>

1. Regulate Basal Metabolic Rate  
(calorigenic Hormone)
2. Carbohydrate, protein & fat metabolism
3. RBC production ↑ (indirectly)
4. Water & Electrolyte Balance  
↳ Aldosterone  
T<sub>3</sub> & T<sub>4</sub>  
ANP
5. Promotes 

}	Physical	Growth
	Mental	
	Sexual	
6. Metamorphosis [larva to Adult]

- Disorder:

### Hyposecretion

TSH ↑ ~~~~~> Thyroid enlargement

- 1) During pregnancy: Growing baby  
↳ stunted growth  
↳ Mental retardation  
↳ Deaf mutism, abnormal skin.

2) During Adult life: Menstrual cycle irregular  
Myxoedema [Gull's disease]

3) Iodine Deficiency: Simple Goitre

4) Hashimoto disease: autoimmune disease

### Hyperscretion

- Development of nodule in thyroid gland
- Cancer of thyroid gland.

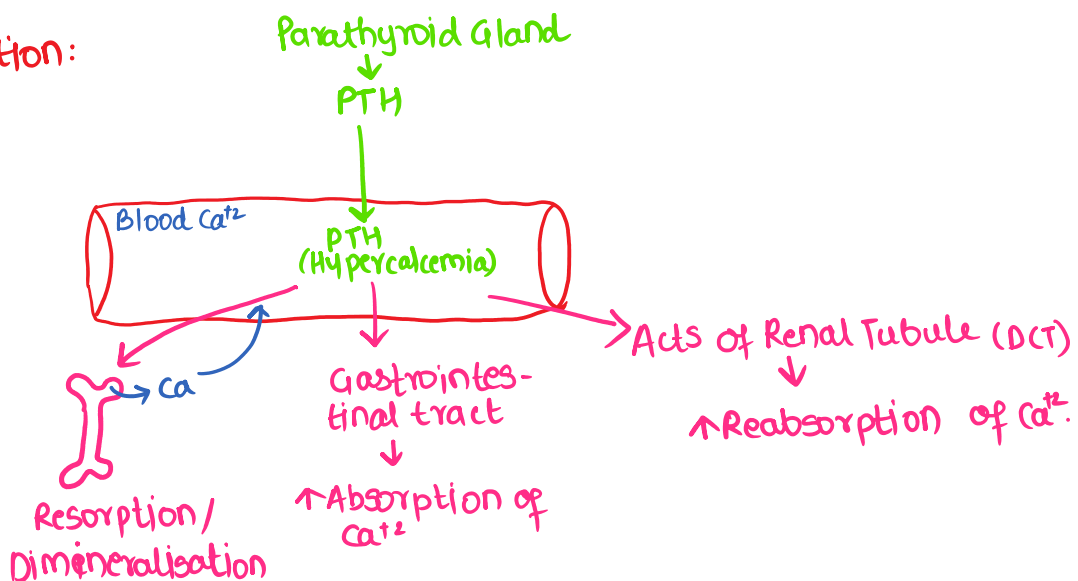
- 1) Exophthalmic Goitre  
(aka Grave's disease)
  - protrusion of eyeball
  - weight loss
  - Body temp ↑↑

## # Parathyroid Gland:- No: 4 Pair: 2

- Back of thyroid gland on dorsal side (2 in each lobe)
- Hormone: Parathyroid Hormone / (PTH)  
Parathormone / collip's Hormone

- peptide Hormone  
Hypercalcemic

- function:



- Disorders: Hypersecretion : 1.) Osteoporosis  
2.) Coronary artery disease  
3.) kidney stones.

Hyposecretion: 1.) tetany  
2.) Blood clotting disorders.

## # Thymus:

- Location: b/w lungs on ventral side of Heart & Aorta
- Thymus quite large at time of birth



Atrophies at birth



Degenerate in old individuals

- It is considered as throne of immunity

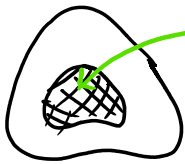
- Hormones (peptide): Thymosins

↓  
maturation of T-cell

↓  
Production of Antibody by B-cell

} Acquired Immunity

## # Adrenal Gland:-



Adrenal Medulla

↑ Activity & Secretion



Adrenaline / Epinephrine

Noradrenaline / Norepinephrine

(Neurotransmitter + Hormones)

} catecholamines

↓  
similar Activity

- Extension of Sympathetic nervous system

- 3rd gland

{ fear  
{ flight  
fight

- ↑ Alertness

pupillary dilation

↑ Sweating

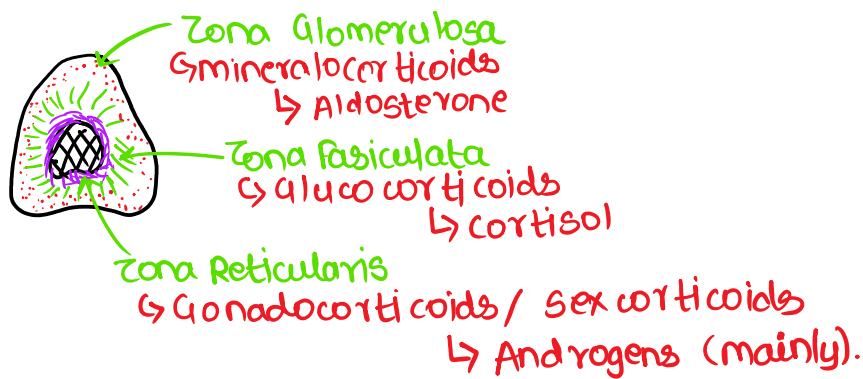
Piloerection

↑ HR, force of contraction, ↑ CO

↑ BR

Glycogenolysis [glycogen ~~~> Glucose]  
protein & fat breakdown.

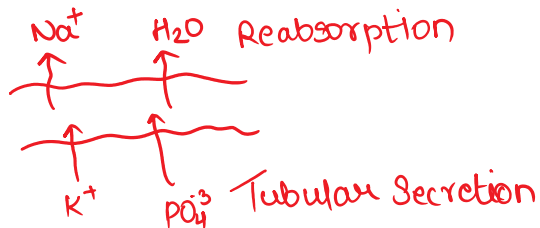
— Zona Glomerulosa



- Zones: 3 zone of Adrenal cortex
- Hormones: Corticoids.

### ① Mineralocorticoids: Aldosterone

- ↳ acts on nephron: DCT
- ↳ Angiotensin II secretes Aldosterone



↳ Hypersecretion: Conn's disease

### ② Glucocorticoids: Cortisol

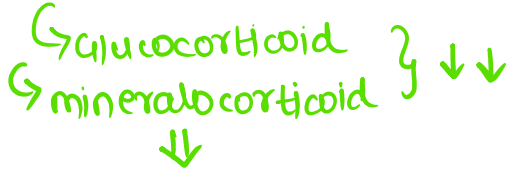
- life saving hormone
- ↑ Blood Glucose level  
Gluconeogenesis
- Cellular uptake & utilization of Amino Acid ↓
- Anti-inflammatory: Immunosuppressant  
(given during organ transplant)
- Effect on CVS & kidney
  - ↓
  - ↑ BP      ↑ GFR
- ↑ RBC production

### ③ Gonadocorticoids: mainly Androgens

↓

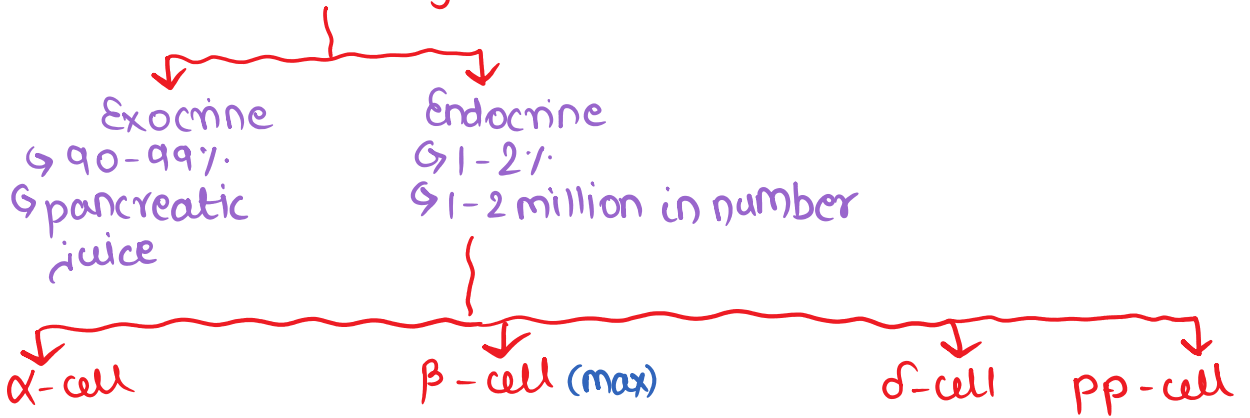
- Androgenic Male pattern
- Secondary Sexual character.

- Disease: Addison's disease ← Thomas Addison: Father of endocrinology  
 ← 1st endocrine disease

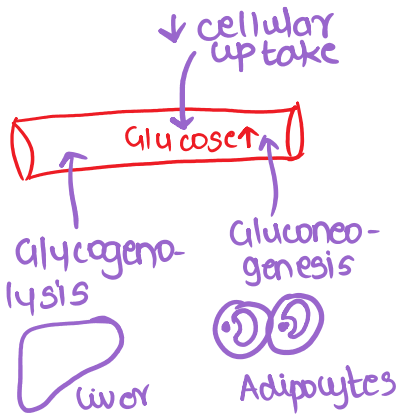


Acute weakness  
 Fatigue [due to ↓ BP, ↓ Blood glucose].

### # Pancreas: Heterocrine / Mixocrine Gland



- Glucagon
- Hyperglycemic



- Insulin
- Hypoglycemic



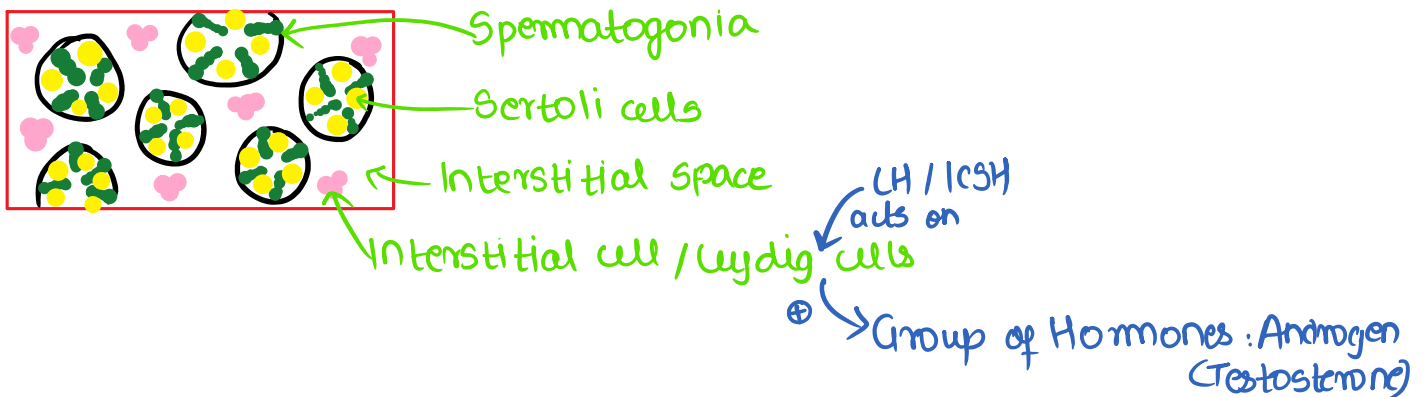
- Pancreatic somatostatin
- Regulates the secretion of Glucagon & Insulin
- pancreatic polypeptide
- Helps in food absorption

- Disease: Diabetes Mellitus

- ↳ Insulin ↓
- ↳ Blood glucose ↑
- ↳ Ketonuria
- ↳ Glycosuria
- ↳ Treatment: Insulin therapy (Inj: subcutaneous)

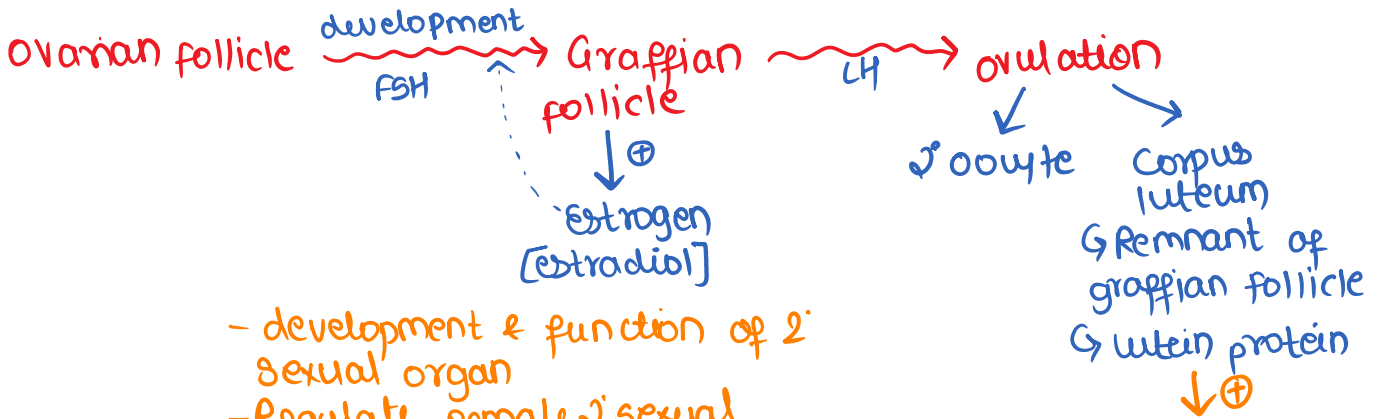
# Gonads:

① Testes: present in scrotal sac



1. Male ↓ Reproductive organ development
2. Male ↓ Sexual character
  - ↳ facial, Axillary, Pubic Hair growth
  - ↳ Muscular growth, ↓ pitch voice
  - ↳ ↑ Aggressiveness
3. Acts on CNS Regulate sexual behaviors (libido)
4. Anabolic effect on protein & carbohydrate metabolism
5. Spermatogenesis ↑ along with FSH
6. RBC production

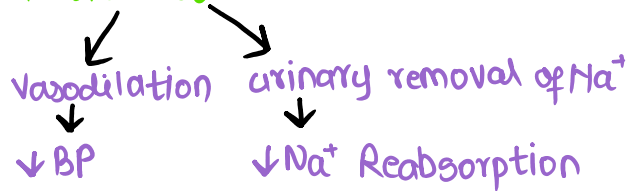
② Ovary: present in abdominal cavity : 1 pair



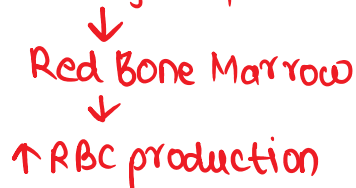
- development & function of 2<sup>nd</sup> sexual organ
- Regulate female's sexual character
- Development of mammary gland
- female sexual behaviour (libido)

- ↓ ⊕  
progesterone
- supports pregnancy
  - development of alveoli of mammary gland
  - secretion of milk.

# Heart: Atrial Natriuretic factor

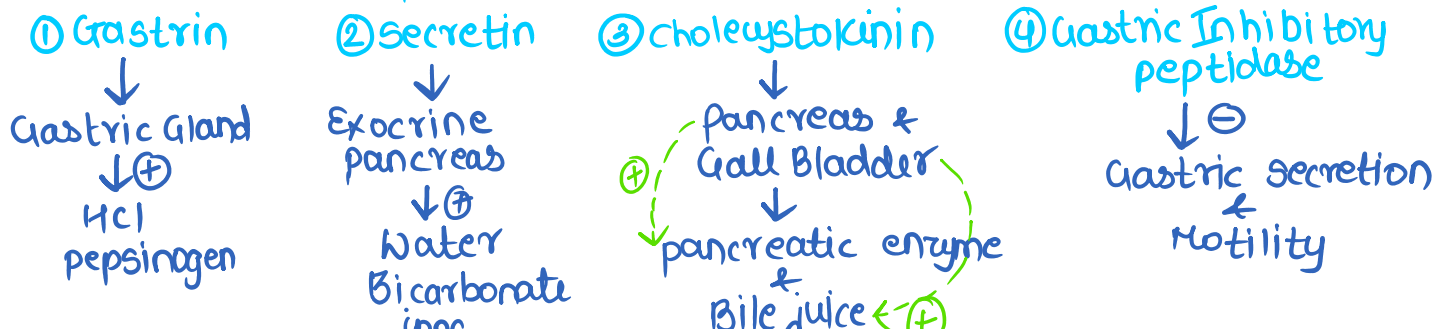


# Kidney: JG cell: Erythropoietin



# Gastrointestinal Tract:-

↳ secretes peptide hormone



pepsinogen

Water  
Bicarbonate ions.

pancreatic enzyme  
&  
Bile juice ← (+)

motility

### # Mechanism of Hormone Action:-

↳ Hormone - Receptor (Protein)  
↓  
Specific for hormone.

1) peptide / polypeptide / protein :-

↳ Hypothalamus , pituitary , TCT , PTH , Thymosins , Pancreas.

2) Amino Acid Derivative :-

↳ Melatonin , Adrenaline/ (Tyrosine)  
(Tryptophan) Noradrenaline

Water soluble

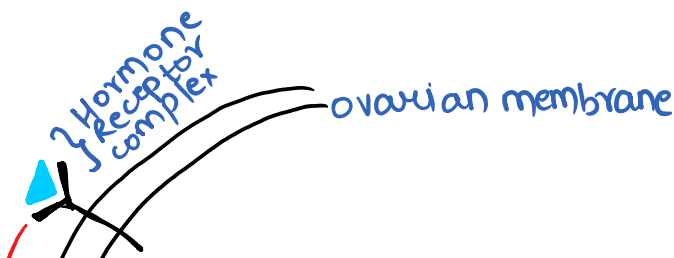
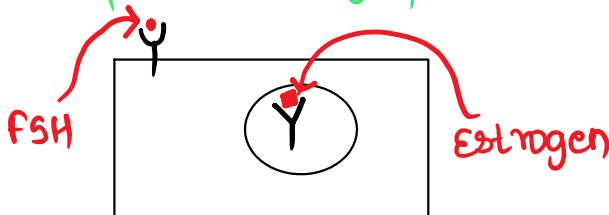
↳ Receptor present on cell surface

3) Iodinated: T<sub>3</sub> & T<sub>4</sub> (Tyrosine)

4) steroid: Adrenal cortex  
gonadocorticoids

Lipid soluble

↳ Receptor present in cytoplasm (nucleus)



Hypothalamus  
↓  
GnRH

