



**Government of Tamilnadu**  
**Department of Employment and Training**

Course : TNPSC Group II Exam

Subject : Zoology

Topic : **Endocrine system**

**ses**

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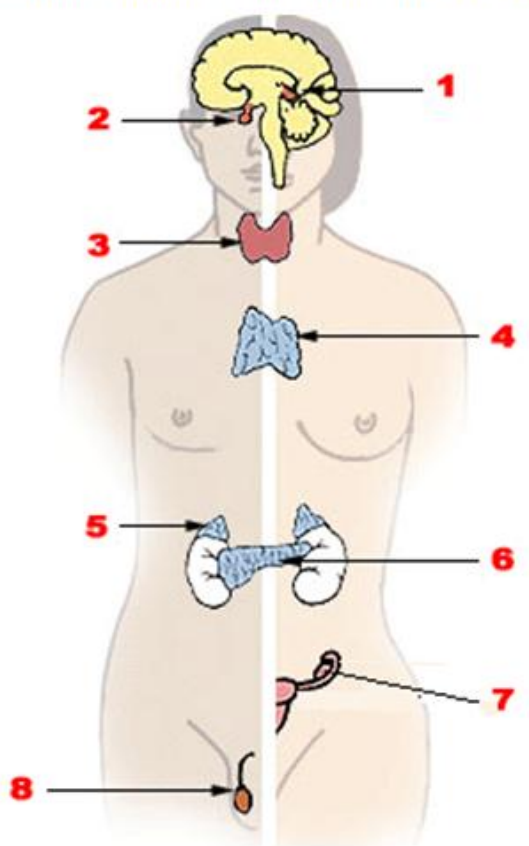


# ENDOCRINE GLANDS

- ❖ Endocrinology – study of endocrine glands and their secretion
- ❖ Father of Endocrine Glands - T. Addison
- ❖ They secrete hormones / chemical messengers
- ❖ Name Hormones was given by E.H.Starling 1906
- ❖ Earliest known hormone is Insulin
- ❖ Insulin were extracted by Banting & Macbet in 1923
- ❖ Thyroxine identified by - E.C. Kondall 1914
- ❖ Molecular structure of Insulin given by Sanger in 1954 He was awarded Nobel prize
- ❖ Fernando Housie 1947 – described functions of pituitary

Endocrine glands are glands of the endocrine system that secrete their products, hormones directly into the blood rather than through a duct.

Major Glands of the Endocrine System



1. Pineal gland
2. Pituitary gland
3. Thyroid gland
4. Thymus
5. Adrenal gland
6. Pancreas
7. Ovary (Female)
8. Testis (Male)

## Characters :

- ❖ Produced by many endocrine glands
- ❖ Pituitary, thyroid, kidney, pancreas, thymus, gonads. Pineal, placenta, intestine
- ❖ Hormones were secreted in to blood prior to use
- ❖ Hormones do not take in metabolic reaction
- ❖ Hormones are produced in low amount
- ❖ After finishing the particular work hormone secretion will stop by feedback mechanism
- ❖ Hormones are easily diffusible through cell membrane
- ❖ Soluble in water, have low molecular weight
- ❖ It balance the internal physiological functions.
- ❖ Hormones are destroyed after use
- ❖ Hormones are not stored in body
- ❖ Hormones are non antigenic so no antibody formation against them

## Chemical nature of Hormones

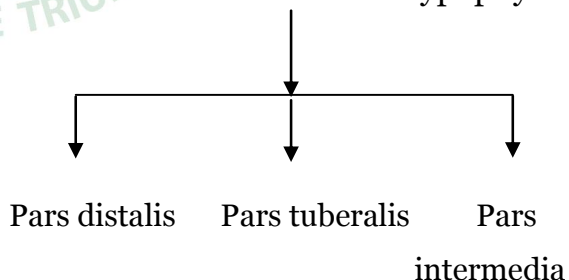
- ❖ Amino acid – Thyroxine, adrenaline, noradrenaline
- ❖ Amine (or) catecholamine – epinephrine, norepinephrine

- ❖ Steroid – adrenal cortex hormones
- ❖ Proteins, polypeptides – oxytoxin, vasopressin, relaxin, insulin
- ❖ Glycoprotein – FSH, CH & TSH
- ❖ Fats – Prostaglandin

## PITUITARY

- ❖ Hypophysis / master gland / Ring Master of the Orchestra
- ❖ Name was given by Vesalius
- ❖ It is found in hypophysis area of brain
- ❖ Made up of two lobes (Front & back)
- ❖ Both were joint by small funnel like infundibulum
- ❖ length 1 cm / breadth - 1.5 cm / weight 0.5 gm

### 1. Anterior lobe – Adenohypophysis



### 2. Posterior lobe - Neurohypophysis pars nervosa

- ❖ pars intermedia is also known as intermediate lobe
- ❖ Removal of pituitary : Hypophysectomy

## **ADENOHYPOPHYSIS:**

### **1. STH / SOMATO TROPHIC**

#### **HORMONE / GROWTH**

#### **HORMONE**

- ❖ STH
- ❖ Growth hormone
- ❖ It controls over all growth of body
- ❖ Its important for bone growth
- ❖ It retains the salts N, K, P, Na salts in body

#### **Hyposecretion of STH (less secretion)**

1. In childrens - dwarfism
2. In adults – Simmond's disease

#### **Hypersecretion of STH (more secretion)**

1. In children - Gigantism
2. In adults – Acromegaly

### **2. TSH / Thyroid stimulating hormone / Thyrotropin**

- ❖ It act on thyroid glands
- ❖ Stimulate the functioning of Thyroid glands
- ❖ Also stimulate uptake of Iodine

### **3. ACTH / Adreno Cartico Tropic Hormone**

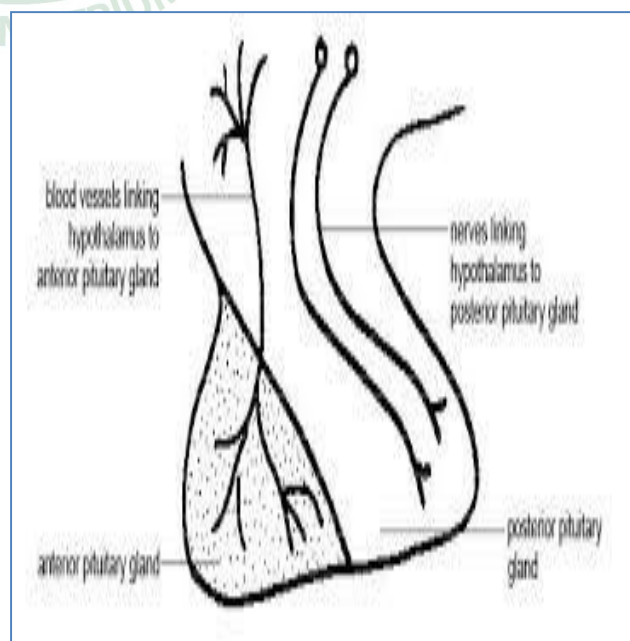
- ❖ Stimulate function of cortex of adrenal glands
- ❖ Stimulate melancocytes and change skin pigments
- ❖ It transports fats from adipose tissues

### **4. FSH / Follile Stimulating Hormone**

- ❖ It is secreted both in male, female and stimulate the development of reproductive cells.

#### **Males:**

- ❖ It acts on testis and stimulates spermatogenesis
- ❖ For this it acts on epithelial cells of sperm tubules



## **Females**

- ❖ It acts on ovaries
- ❖ Total weight of ovary increases
- ❖ It stimulates the graafian follicle cells for production of ovum cells.

makes the parturition (quick birth of young one)

- ❖ It stimulates the flow of milk by contraction of myoepithelial cells of mammary glands.

## **5. LTH / Leuto trophic hormone / prolactin**

- ❖ It influences growth of mammary glands and secretion of milk during pregnancy
- ❖ It acts on corpus luteum to secrete progesterone
- ❖ It joins with oestrogen for milk secretion

## **2. Vasopressin / ADH – Anti Diuretic hormone / Pitressin**

- ❖ It influence water balance by reducing output of urine by this the essential minerals are retained
- ❖ It controls blood pressure
- ❖ It store the Urea
- ❖ Less secretion leads to Diabetes insipidus

## **6. LT / Luteinizing hormone**

- ❖ Its function is the release of ovum from ovaries
- ❖ When the ovum is transferred to uterus. The empty graafian follicle become corpus luteum

## **Symptoms :**

- ❖ polyurea - more urination
- ❖ polydipsia - more water drinking
- ❖ polyphagia - more food intake

## **7. ICSH / Interstitial cells stimulating hormone**

- ❖ In males it stimulates the interstitial cells in testis for the secretion of testosterone.

## **NEURO HYPOPHYOSIS**

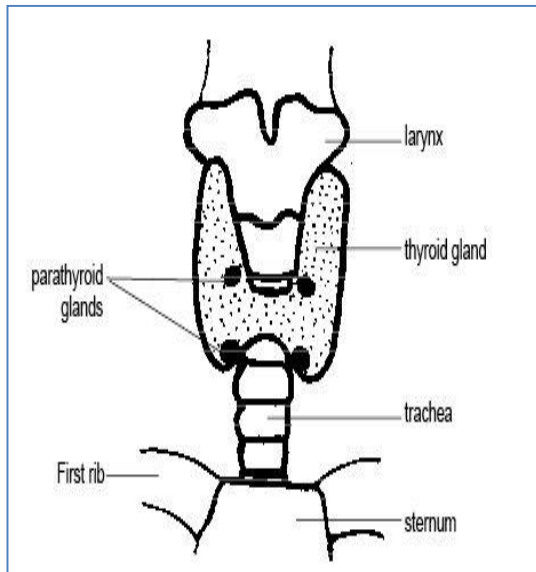
### **1. Oxytocin / pitocin**

- ❖ It stimulates the contraction of smooth muscle of uterus and

## **THYROID:**

- ❖ It is the largest endocrine gland and situated in neck region
- ❖ It has 2 lobes
- ❖ Present on ventral side of trachea
- ❖ Both the lobes of thyroid are connected by a sheath of connective tissue known as isthmus





### HYPOTHYROIDISM:

#### **1) Simple Goitre / Endemic goitre**

- Thyroid gland increases in size.

#### **2) Cretinism**

- Hyposecretion in children results Cretinism.
- Sex organ retard / low IQ / deformed bones.

❖ Thyroxine first isolated by :  
Kocher

❖ Crystal of thyroxine were 1<sup>st</sup>  
prepared by : Kendall

❖ Molecular structure given by :  
Harrington

#### **3) Myxoedema / Gull's Disease**

- Body weight increase , low pulse rate
- Skin becomes puffy, become dry, patient feel cold

### **Function of Thyroid**

- ❖ It is important for development of nervous system in foetus and after birth upto one year in childrens.
- ❖ It control BMR (Basal Metabolic Rate)
- ❖ It reduces cholesterol level in blood.
- ❖ It stimulates metamorphosis
- ❖ It indirectly controls the body growth, so it is also known as manly hormone.

### Hyperthyroidism

- ❖ In childhood early sexual maturity takes place.
- ❖ In adult may result Graves disease
- ❖ Treatment is only surgey of gland

### Parathyroid Gland

- ❖ Two pairs embedded in thyroid lobes.
- ❖ Colour : purple/ elongated in shape
- ❖ This hormone studied and discovered by - Collip

- ❖ Structure given by
  - Sandstrom
- ❖ Molecular structure by
  - Pot
- ❖ Crystals by - Craig
- ❖ It secretes two hormones.

- ❖ Cortex : 80% / Medulla - 20%
- ❖ Cortex is divided into 3 parts
  1. Zona glomerulosa - Outer - mineralo corticoid Hormone
  2. Zona fasciculata - Middle - Gluco corticoid Hormone
  3. Zona Reticulata - Inner - Sex Hormones

### 1) Parathormone

- ❖ It works for small duration only.
- ❖ Its half life period is 20-30 minutes only
- ❖ It works on three parts.
- ❖ Bones → It gives new structure
- ❖ Kidneys → It regulates  $P^H$
- ❖ Intestine → It helps in Vitamin D synthesis

- ❖ Medulla has two hormones
  1. Adrenaline (or) Epinephrine - 80%
  2. Nor adrenaline (or) Nor Epinephrine - 20%

### Adrenaline / Emergency Hormones:

### 2) Calcitonin

- ❖ Lower the level of calcium in blood.
- ❖ It secretes HCL in stomach
- ❖ It is antagonistic to Parathormone.

### ADRENAL GLAND

- ❖ It is also known as emergency gland
- ❖ Also known as suprarenal gland
- ❖ It is situated at the top of the kidney
- ❖ It was discovered by : Eustachian
- ❖ It divided 2 distinct regions

3F Hormone	4S Hormone
F- Fear	S- Sugar Metabolism
F- Fight	S - Salt Retaining
F- Flight	S- Sex Hormone
	S- Source of Energy

- ❖ It increases flow of blood.
- ❖ It contracts arrector pili muscle.
- ❖ It increases respiration and increase the sharpness of brain.
- ❖ It increases heart beat rate.
- ❖ It increases blood glucose level



**Noradrenaline:**

- ❖ It raises blood pressure
- ❖ It is antagonistic to adrenaline

**GONADS**

**Testis**

- ❖ It has epithelial cells called Leydig cells which produce reproductive cells.
- ❖ Leydig cells act as endocrine glands.
- ❖ It secretes Androgens and important is testosterone

**TESTOSTERONE**

**Functions :**

- ❖ It is responsible for proper development of secondary sexual characters in male. e.g : deep voice
- ❖ Enlargement of genital organs.
- ❖ Appearance of beard
- ❖ Growth and function of epididymis and vas deferens, prostate gland, seminal vesicle and penis

**Ovary :**

- ❖ A pair of round structures present in lower abdomen
- ❖ It has three secretions

**1) Estrogens / Oestrogens**

- ❖ It is secreted by Graafian follicle, induced by FSH
- ❖ Estrogen is responsible for development of secondary sexual characters in female.
- ❖ Thin voice, complete development of ovary, oviduct, mammary gland, uterus and vagina.

**2) Progesterone**

- ❖ It is a hormone produced by corpus luteum
- ❖ It also decreases level of FSH so maturation of new ovum and follicle is checked.
- ❖ It prepares the endometrium for implantation of the embryo or foetus.
- ❖ It helps in implantation with the wall of uterus.
- ❖ It maintains pregnancy so known as pregnancy hormone
- ❖ It stimulates the growth of breast and mammary gland during pregnancy
- ❖ It suppresses the contraction of uterine muscle during pregnancy

- ❖ It is also called anti abortion hormone.

### 3) Relaxin

- ❖ It secreted by corpus luteum of pregnant woman
- ❖ Which relax the pubis symphysis and pelvic girdle to make the child birth easy.

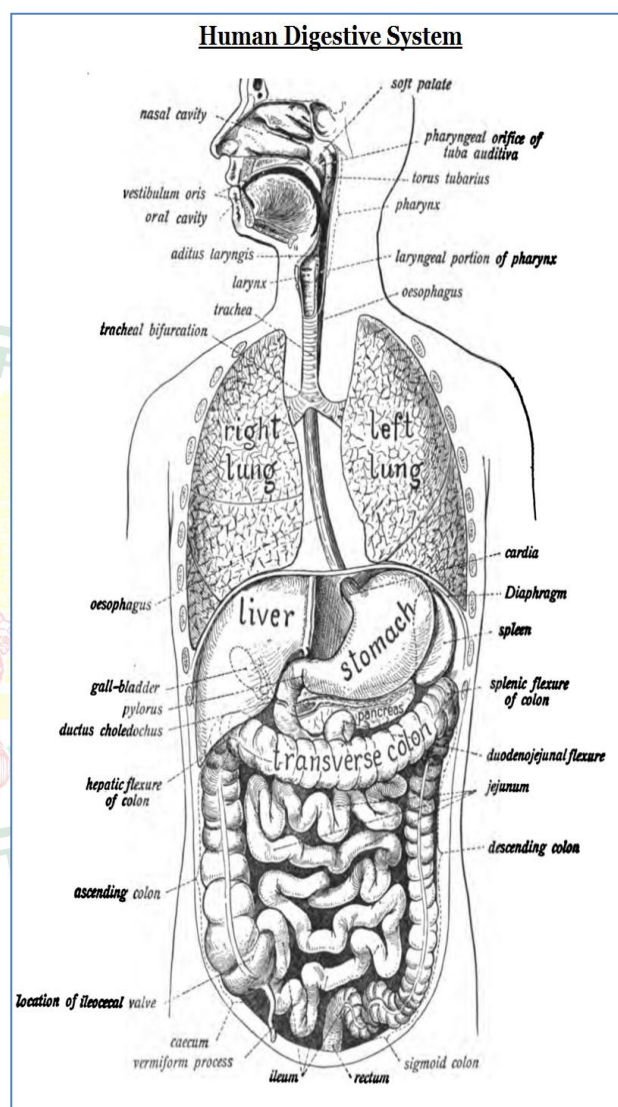
### Digestive System

- The human digestive system consists of the gastrointestinal tract plus the accessory organs of digestion (the tongue, salivary glands, pancreas, liver and gall bladder).
- In this system, the process of digestion has many stages the first of which starts in the mouth (oral cavity)

### Thymus

- ❖ It is endocrine gland nearest to the heart
- ❖ It is partly endocrine and partly lymphoid
- ❖ It play important role in immunity
- ❖ It produces thymine
- ❖ Hassell's corpuscles are found in thymus and also know as Thymic cells.

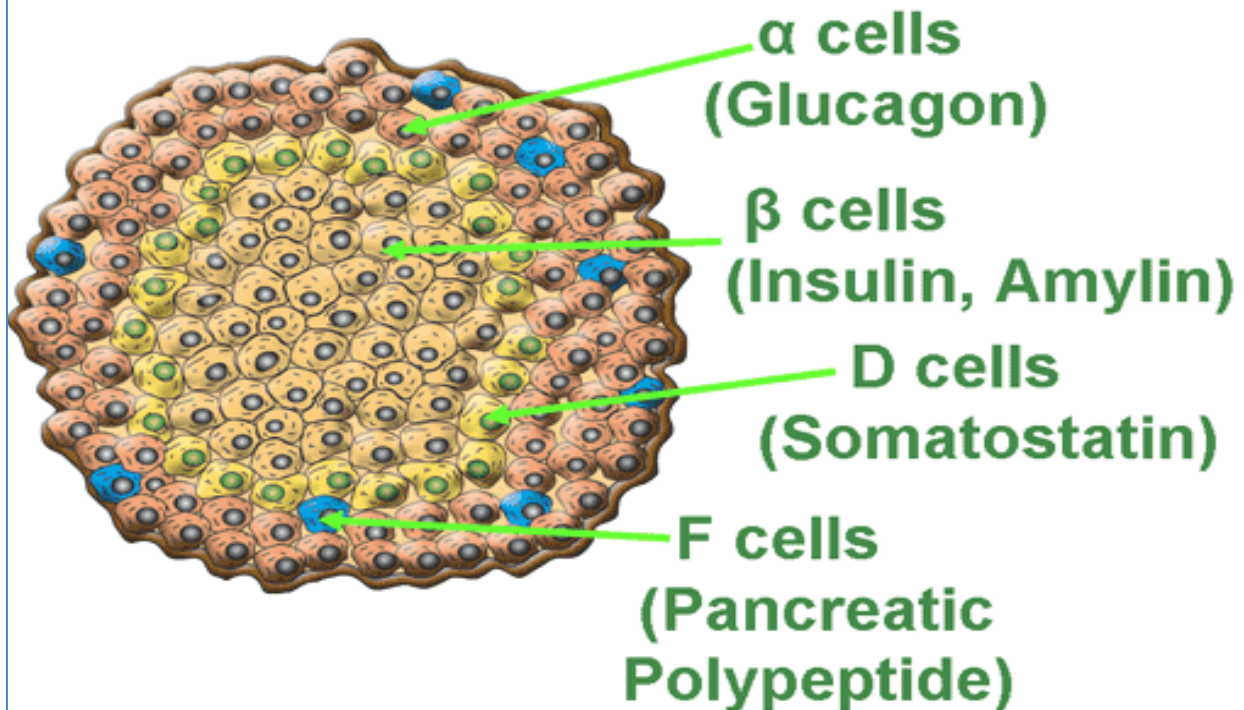
- ❖ It play important role in formation of Antibodies in embryo and infants.
- ❖ T – cells or T- Lymphocyte cells are produced in Thymus.



### Digestive Glands

- Salivary glands
- Gastric glands
- Liver
- Pancreas
- Intestinal glands

## PANCREATIC ISLET



1. Starch into sugar.
  2. Gastric acts on the gastric glands and stimulates the secretion of HCL and Pepsinogen.
  3. It secretes bile juice that is stored in a sac called the gallbladder.
  4. Pancreas: Exocrine portion secretes an alkaline Pancreatic juice containing enzymes. Endocrine portion secretes Hormones, Insulin, Glucagon.
- ❖ Pineal secretes a Hormone called Melatonin
  - ❖ Pineal body found in brain
  - ❖ Pineal body represent vestige of 3<sup>rd</sup> eye in man.
  - ❖ It regulates sleep and wakefulness.
  - ❖ Melatonin also influences Metabolism, Pigmentation, the menstrual cycle as well as our defence capability.

### Pineal body

- ❖ It atrophies in man at the age of 7 years.

### Pancreas

- ❖ Pancreas is a mixed type of gland in which pancreatic acini are



exocrine and islets of

### Insulin Deficiency

Langerhans is endocrine

- ❖ Pancreas are three endocrine
- ❖  $\alpha$  cells - larger - peripheral cell produce glucagon
- ❖  $\beta$  cells - central and smaller cell - produce insulin
- ❖  $\gamma$  or  $\delta$  cells - Middle - produce somatostatin

- The glucose level in blood increased and it is excreted through urine.
- This condition is known as Diabetes mellitus

### Glucose level

- Fasting - 70- 110 mg / decilitre
- Normal - 80 - 120 mg / decilitre
- Excess - 140 - 150 mg / decilitre
- Abnormal - 300 - 400 mg / decilitre

### Insulin

- Glucose - Glycogen
- It stimulates glycogenolysis
- It oxidises glucose more in tissues
- It converts glucose into fatty acids and stores in tissues

### Glucagon

- It is antagonistic to insulin increase blood sugar level in blood stream.
- It stimulates glycogenolysis
- Glycogen - glucose
- It makes glucose from the non carbohydrate materials of the body.
- In kidneys it increases the filtration of glucose

