The Endocrine System

The endocrine system is a chemical control system. It functions in conjunction with the nervous system to control the internal environment (homeostasis).

TABLE 26.3 | MAJOR HUMAN ENDOCRINE GLANDS AND SOME OF THEIR HORMONES

Gland (module)	Hormone	Chemical Class	Representative Actions	Regulated by
Thyroid gland (26.5–6)	Thyroxine (T_4) and triiodothyronine (T_3)	Amine	Stimulate and maintain metabolic processes	TSH
	Calcitonin	Peptide	Lowers blood calcium level	Calcium in blood
Parathyroid glands (26.5–6)	Parathyroid hormone (PTH)	Peptide	Raises blood calcium level	Calcium in blood
Thymus (26.3)	Thymosin	Peptide	Stimulates T cell development	Not known
Adrenal gland (26.9)				
Adrenal medulla	Epinephrine and norepinephrine	Amine	Increase blood glucose; increase metabolic activities; constrict certain blood vessels	Nervous system
Adrenal cortex	Glucocorticoids	Steroid	Increase blood glucose	ACTH
	Mineralocorticoids	Steroid	Promote reabsorption of Na^+ and excretion of K^+ in kidneys	K^+ in blood
Pancreas (26.7–8)	Insulin	Protein	Lowers blood glucose	Glucose in blood
	Glucagon	Protein	Raises blood glucose	Glucose in blood
Testes (26.10)	Androgens	Steroid	Support sperm formation; promote development and maintenance of male secondary sex characteristics	FSH and LH
Ovaries (26.10)	Estrogens	Steroid	Stimulate uterine lining growth; promote development and maintenance of female secondary sex characteristics	FSH and LH
	Progesterone	Steroid	Promotes uterine lining growth	FSH and LH

Endocrine gland is :

I. Pituitary Gland - (Hypophysis) [Master Gland]

-Anterior Pituitary Lobe - (Adenohypophysis)

-Posterior Pituitary Lobe (Neurohypophysis)

II. Thyroid Gland

III. Parathyroid

IV. Adrenal Glands

-Adrenal Cortex

-Adrenal Medulla

VI. Pancreas - (Islets of Langerhans cells)

VII. Pineal Gland

VIII. Parathyroid Glands

II. Pituitary Gland - (Hypophysis) [Master Gland]

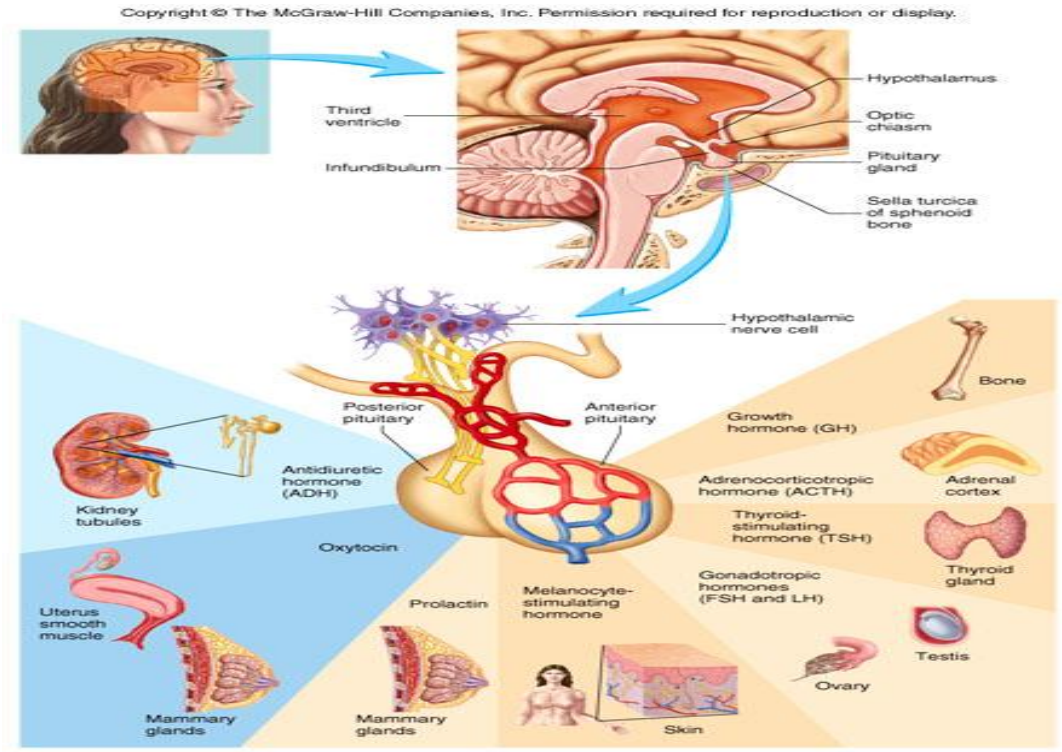
A. Location

- attached to Hypothalamus by a stalk called Infundibulum

B. Structure

1. Anterior lobe – [glandular part] - Adenohypophysis

2. Posterior lobe – [neural part] – Neurohypophysis



C. Anterior Pituitary - (Adenohypophysis)

Growth Hormone (GH) - Somatotrophic Hormone (STH)

1. Increases Growth and Maintenance of Organs by:

a. stimulating protein anabolism

b. promotes fat catabolism (use of fat rather than sugars for energy)

2. Abnormal Secretions of STH

a. Giantism -- hypersecretion during childhood (before epiphyseal plates close)

b. Acromegaly -- hypersecretion during adulthood

c. Dwarfism -- hyposecretion during childhood

d. Cachexia (Simmond's Disease) - hyposecretion during adulthood causes premature aging and atrophy of organs

Prolactin - (Lactogenic Hormone)

1. promotes breast development during pregnancy
2. stimulates mammary glands to produce milk after delivery

Thyroid Stimulating Hormone (TSH) - (Thyrotropin)

1. promotes growth of the Thyroid Gland

2. stimulates the secretion of the Thyroid Hormone

Adrenocorticotropin -- (ACTH)

1. promotes growth of the Adrenal Cortex

2. stimulates the secretion of Cortical Hormones

3. stimulates Fat Catabolism & Glycogenesis

Gonadotropins - FSH and LH

1. Follicle Stimulating Hormone (FSH)

a. female - stimulates the Ovarian Follicles to Develop and produce ova - stimulates the Ovarian Follicles to secrete Estrogens

b. male- stimulates the production of sperm

- stimulates the secretion of Testosterone

2. Luteinizing Hormone (LH)

a. female - associated with FSH in development of the Ovarian Follicles

- stimulates development of the Corpus Luteum following ovulation

- stimulates Corpus Luteum to secrete Progesterone

b. male - stimulates the Interstitial Cells to secrete Testosterone (also called Interstitial Cell Stimulating Hormone [ICSH])

D. Posterior Pituitary Lobe (Neurohypophysis)

1. Antidiuretic Hormone (ADH) - produced in the hypothalamus and collected and secreted by the posterior lobe

a. increases the permeability of the kidney tubules to water

b. promotes the reabsorption of the water from the urinary filtrate resulting in a smaller volume of urine

c. Diabetes insipidus - condition resulting in larger volumes of urine produced - may be treated with vasopressin

2. Oxytocin

a. stimulates powerful contractions of the pregnant uterus at the time of delivery

b. causes milk ejection from the lactating breast

III. THYROID GLAND

A. Location - lower aspect of larynx and upper trachea

- two lateral lobe connected by an isthmus on anterior surface of superior trachea

B. Function -

1. Thyroid Follicles - functional units

a. follicle cells secrete Thyroxine (Thyroid Hormone)

Thyroxine is a combination of Tyrosine & Iodine to make two compounds:
Tetraiodothyronine - T_4

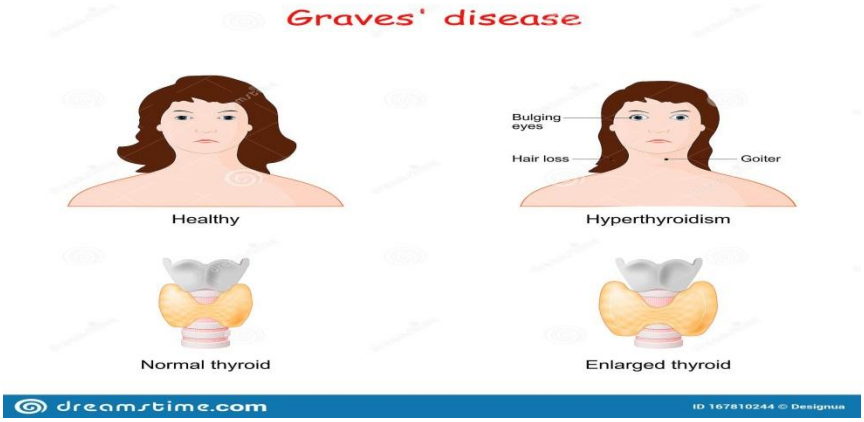
Triiodothyronine - T_3

3. Disorders of the Thyroid

a. Hyperthyroidism (Grave's disease)

- increases nervousness and irritability

- exophthalmos - results in edema behind the eyes



b. Hypothyroidism

Cretinism - occurs if the hyposecretion is during fetal or early developmental life.

- results in reduced growth

- results in mental retardation

Myxedema - occurs if the hyposecretion is during adult life

- results in reduced mental & physical activity

- results in accumulation of subcutaneous fluids