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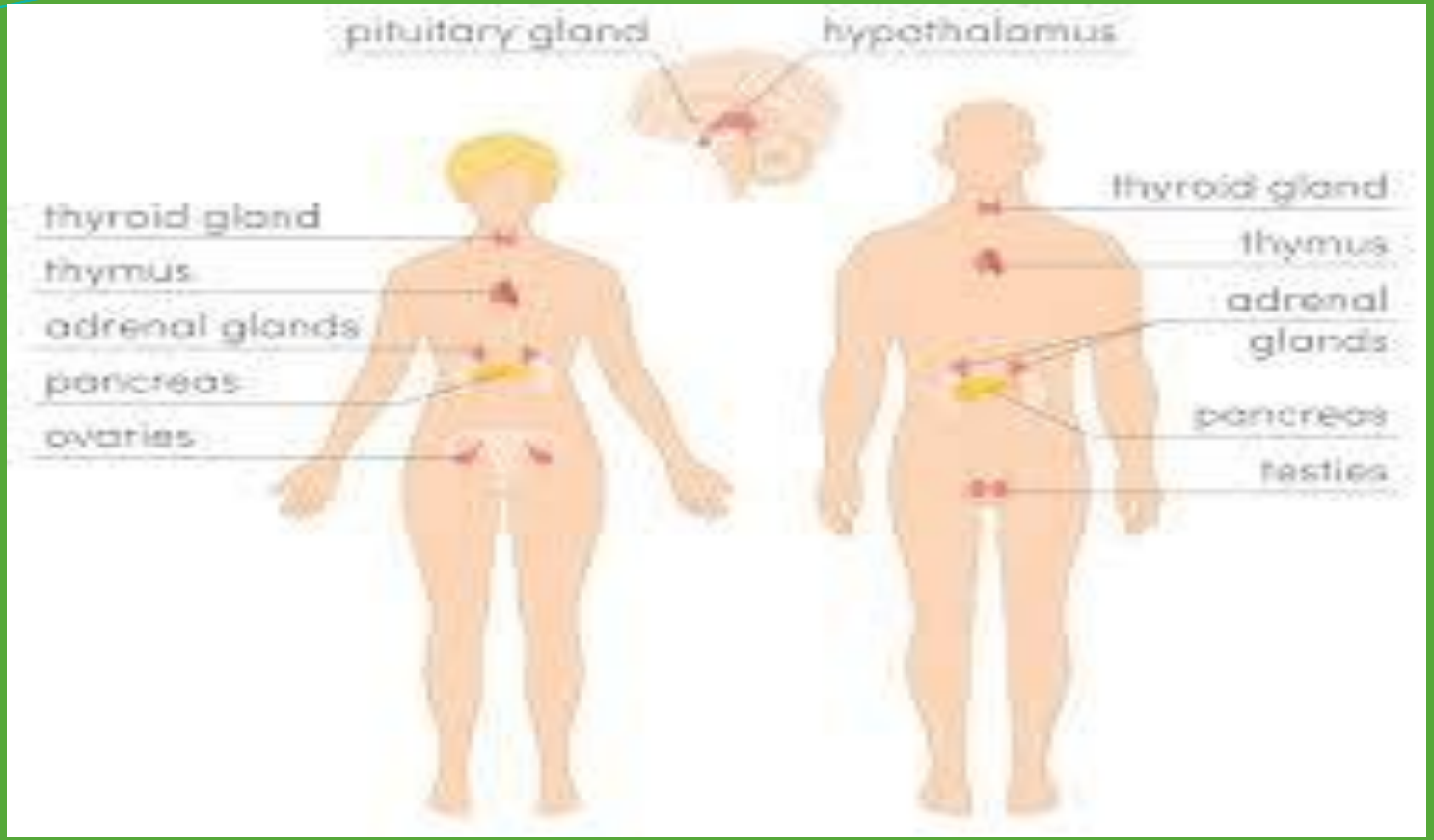
NEUROPSYCHOLOGY

NEUROENDOCRINE SYSTEM

INTRODUCTION

- The **endocrine system** is the collection of glands that produce hormones that regulate metabolism, growth and development, tissue function, sexual function, reproduction, sleep, and mood, among other things.


pituitary gland
hypothalamus
thyroid gland
thymus
adrenal glands
pancreas
ovaries
thyroid gland
thymus
adrenal glands
pancreas
testes

GLANDS

- Glands are of two types
- (a) Duct glands
- (b) Ductless or Endocrine glands.
- **Duct glands**:- Secretion from duct glands like the tear and salivary glands do not mix with blood. They are not yet known to play any important role in the development of the fetus or his behaviour, until the child is born.

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- **DUCTLESS GLAND:-** The endocrine gland develop earlier than other glands. An endocrine gland is a ductless gland or organ of secretion which forms a specific chemical substance and passes them directly or indirectly into the circulating fluid to produce physiological effects upon other organs. Endocrine gland plays significant role in the development of fetus and in the growth of personality. The endocrine gland are supplied with blood vessels but they have no ducts. They pass their secretion directly into the blood stream. The chemical substance secreted from the endocrine are known as HORMONES. Hormone literally means “I excite or I arouse.”

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- The hypothalamus is the master control of the endocrine system. The study by Zukerman (1957)suggested that the nerve cells in the hypothalamus may even secrete certain regulatory hormones.
- **THE PITUITARY GLAND** :-
- The pituitary gland or hypophysis is attached to the hypothalamus at the base of the brain. •
- The hypothalamus is the major integrating link between the nervous and endocrine systems.
- Although the pituitary gland is sometimes called the “master” endocrine gland.
- Together, the hypothalamus and pituitary gland regulate virtually all aspects of growth, development, metabolism, and homeostasis. •
- The pituitary gland can be divided into the posterior pituitary and anterior pituitary.

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- It is the size of a pea, weighs about 500 mg and consists of two main parts that originate from different types of cells.
- The anterior pituitary (adenohypophysis) is an up growth of glandular epithelium from the pharynx and the posterior pituitary (neurohypophysis) a down growth of nervous tissue from the brain.
- • There is a network of nerve fibers between the hypothalamus and the posterior pituitary.
- Hormones of the pituitary gland: Anterior pituitary = GH TSH ACTH PRL LH FSH Posterior pituitary = Vassopressin or ADH oxytocin

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- **THE POSTERIOR PITUITARY** • The posterior pituitary works as a unit with the hypothalamus. • Although the posterior pituitary does not synthesize its own hormones, it does store and release oxytocin (OT) and antidiuretic hormone (ADH) produced in the hypothalamus. – OT controls uterine contractions during delivery and milk ejection during breastfeeding. – ADH causes retention of body water, controlling the body's water-balancing mechanism.
- THE ANTERIOR PITUITARY
- The anterior pituitary secretes hormones that control a wide range of bodily activities. •
- The hypothalamus regulates the anterior pituitary by producing releasing hormones •
- that stimulate release of anterior pituitary gland hormones and inhibiting hormones that suppress release of anterior pituitary gland hormones.
- The Anterior pituitary has five principle types of cells which secrete seven major hormones.

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- ANTERIOR PITUITARY HORMONES • GH : which stimulates general body growth and regulates certain aspects of metabolism.
- • thyroid stimulating hormone (TSH), which controls secretions and other activities of the thyroid gland.
- • follicle-stimulating hormone (FSH) and luteinizing hormone (LH). Together FSH and LH stimulate the secretion of estrogen and progesterone and the maturation of oocytes in the ovaries and the secretion of testosterone and sperm production in the testes.
- prolactin (PRL), which initiates milk production in the mammary glands.
- • adrenocorticotropic hormone (ACTH) and melanocyte-stimulating hormone (MSH). ACTH stimulates the adrenal cortex to secrete glucocorticoids. MSH affects skin pigmentation

- GH: Growth hormone:
- • This is the most abundant hormone synthesised by the anterior pituitary.
- • It stimulates growth and division of most body cells but especially those in the bones and skeletal muscles.
- • Body growth in response to the secretion of GH is evident during childhood and adolescence, and thereafter secretion of GH maintains the mass of bones and skeletal muscles

THE THYROID GLAND

- The thyroid gland is situated in the neck in front of the larynx and trachea at the level of the 5th, 6th and 7th cervical and 1st thoracic vertebrae.
- • It is a highly vascular gland that weighs about 25 g and is surrounded by a fibrous capsule.
- • It resembles a butterfly in shape, consisting of two lobes, one on either side of the thyroid cartilage and upper cartilaginous rings of the trachea.
- Thyroid hormones
- Thyroxine and tri-iodothyronine •
- Iodine is essential for the formation of the thyroid hormones, thyroxine (T_4) and tri-iodothyronine (T_3),
- The thyroid gland selectively takes up iodine from the blood, a process called iodine trapping.
- • The release of T_3 and T_4 into the blood is stimulated by thyroid stimulating hormone (TSH) from the anterior pituitary.

THE PARATHYROID GLANDS

- There are four small parathyroid glands, each weighing around 50 g, two embedded in the posterior surface of each lobe of the thyroid gland.
- • They are surrounded by fine connective tissue capsules that contain spherical cells arranged in columns with sinusoids containing blood in between them.
- Function:-
- • These glands secrete parathyroid hormone (PTH, parathormone). Secretion is regulated by blood calcium levels.
- • The main function of PTH is to increase blood calcium levels. This is achieved by increasing the calcium absorption from the small intestine and reabsorption from the renal tubules.

THE ADRENAL GLANDS

- The paired adrenal (suprarenal) glands lie superior to the kidneys enclosed within the renal fascia.
- • They are about 4 cm long and 3 cm thick.
- • The adrenal glands are composed of the outer adrenal cortex and the inner adrenal medulla.
- • The adrenal cortex produces a total of about 40 different hormones which are collectively known as corticosteroids.
- • The complete loss of adrenocorticol hormones leads to death within a few days to a week, due to dehydration and electrolyte imballances.

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- Hormones of the adrenal gland:
- • Adrenal cortex: cortisol
- • corticosterone
- • cortisone
- • aldosterone
- • androgens
- • Adrenal medulla: epinephrine
- • Nor- epinephrine

THE PANCREAS

- • Since the pancreas is classified as both and endocrine organ and an exocrine organ, it will also be discussed again with the digestive system.
- • There are three main types of cells in the pancreatic islets:
- • (alpha) cells, which secrete glucagon
- • (beta) cells, which are the most numerous, secrete insulin
  • (delta) cells, which secrete somatostatin (GHRIH,

Pineal gland

- The pineal gland is a small body attached to the roof of the third ventricle and is connected to it by a short stalk containing nerves, many of which terminate in the hypothalamus. The pineal gland is about 10 mm long, reddish brown in colour and surrounded by a capsule. The gland tends to atrophy after puberty and may become calcified in later life.
- Function
- • The physiological role of the pineal gland remains unclear.
- • The pineal gland secretes melatonin, which is thought to promote sleepiness and help regulate the body's biological clock. In animals that breed during specific seasons, melatonin apparently alters their capacity for reproduction, but it has not been shown to have a similar effect on humans

THANK YOU