

ENDOCRINE SYSTEM

Endocrine system: - The endocrine system are involved in the maintenance of homeostasis of the internal environment. The endocrine system consists of some glands and some tissues in other organs.

Glands: - They are groups of epithelial cells that produce specialized secretions i: e, gland is an organ of the body which produces a substance that needs such as hormone sweat or saliva. Glands are broadly classified into 2 types.

- i) Exocrine glands.
- ii) Endocrine glands.

Exocrine glands: - are those glands which discharge their secretions on the surface (e,g salivary glands) or through a duct (e,g salivary gland). Secretions of exocrine gland include mucous, saliva, digestive juices, air wax etc.

Endocrine glands: - These are also called as ductless glands. These glands their secretions into blood and lymph. They do not have duct. The secretions of endocrine glands are called hormones eg thyroid hormone, insulin etc. Endocrine glands include:-

- 1 Pituitary gland and hypothalamus.
- 2 Pineal gland/body.
- 3 Thyroid gland anterior pituitary lobe.
- 4 Para thyroid glands (behind thyroid).
- 5 Thymus glands
- 6 Adrenal glands
- 7 Pancreatic gland (islets of langerhans)

Pituitary gland: - it is also called hypophysis .It is the master endocrine gland. It regulates the activity and secretions of all other endocrine glands. It is situated in the bony hollow, just behind the bridge of your nose. It is pea-shaped gland and weighs about 500 mg. it has three parts are lobes.

- i. Anterior pituitary lobe
- ii. Posterior pituitary lobe
- iii. Intermediate lobe

Hypothalamus is a structure within the brain that can control the pituitary gland. It is situated above the pituitary gland. It is also called master of master gland.

- i. **Anterior pituitary lobe:** - is also called adenohypophysis. It is a part of pituitary gland which is present anteriorly. It consists of glandular epithelial cells.

- ii. Posterior pituitary lobe:- is also called Neurohypophysis. It is made up of nervous tissue from the brain. There is a network of tissue fibres. Between the hypothalamus and the posterior pituitary.
- iii. Intermediate lobe:- Between these two lobes there is a thin strip of tissues called as intermediate lobe and its function in humans is not known.

Hormones of anterior pituitary:-

- i. Growth hormone:- Is necessary for the normal growth and development of the body.
- ii. Thyroid stimulating hormone:- TSH is also synthesized by the anterior pituitary gland. The thyroid releasing hormone (TRH) from the hypothalamus stimulates the release of TSH. TSH helps in the growth and activity of the thyroid gland.
- iii. Adrenocorticotrophic hormone (ACTH):- stimulates the adrenal cortex to synthesize its hormones i: e, glucocorticoids, Mineral corticoid, Sex corticoids.
- iv. Follicle stimulating hormone (FSH):- it stimulates ovary in females to synthesize estrogen tests in males to produce spermatozoa.
- v. Luteinizing hormone (LH):- stimulates Ovary in females to produce progesterone. Testes in males to produce testosterone.
- vi. Luteotrophic hormone:- stimulates milk production in females.

Hormones of posterior pituitary lobe:- The posterior lobe of pituitary secretes 2 -hormones. They are oxytocin and vasopressin.

Oxytocin:- has two functions

Contraction of uterus during labour and to bring about parturition (that is birth of baby).

Ejection of milk from breasts.

Vasopressin:- Or (anti diuretic hormone, ADH) .Its functions are:

Decreasing urine output by increasing tubular reabsorption in the kidney.

Increasing B.P by constricting capillaries and arterioles.

Pineal gland/body:- it is very small gland situated in the brain. It is reddish grey in colour. It measures about 10mm in length. Pineal gland atrophies after puberty and later becomes classified. The secretion of the pineal gland is melatonin. The secretion of melatonin is controlled by daylight. Its secretion is highest at night and lowest in the midday.

FUNCTIONS: Exact functions unknown, melatonin maintains the circadian rhythm

It also inhibits the development of sex- organs before puberty.

THYROID GLANDS: - is a butterfly shaped gland situated in the neck in front of the larynx and trachea. The thyroid gland has 2 lobes connected by isthmus. These lobes are roughly conical shaped and is about 5cm long and 3cm wide. It is highly vascular and is about 25gms in weight.

STRUCTURE: - The thyroid gland is surrounded by a fibrous capsule. It contains spherical follicles filled with colloid. The follicles are formed of cuboidal epithelium and contain a thick sticky protein material. The Para follicular cells/ c-cells are present between the follicles. These c-cells secrete calcitonin hormone. (Reduce the level of blood calcium level when it is raised).

FUNCTIONS:-

Increase in oxygen consumption and heat-production in tissues.

Increase BMR.

Increase in the absorption and utilization of glucose.

Increase in the rate of cholesterol synthesis in liver.

Storage of iodine

Anabolic effects like growth promotion and protein synthesis.

DISORDERS OF THYROID FUNCTION:-

HYPOTHYROIDISM: - It is an endocrine disorder in which the thyroid gland does not produce enough thyroid hormone. It can cause a number of symptoms such as, poor ability to tolerate cold, a feeling of tiredness, constipation, depression and weight gain.

HYPERTHYROIDISM: - also called overactive thyroid disease, means your thyroid gland makes and releases too much thyroid hormone. It can also cause nervousness, increased perspiration (sweatiness), rapid heart beat, difficulty in sleeping and weight loss.

Difference between hyperthyroidism and hypothyroidism.

HYPERTHYROIDISM

- Increased BMR
- Weight loss, good appetite
- Anxiety, physical restlessness, mental...
- Hair loss
- Tachycardia and palpitations
- Warm sweaty skin, heat intolerance
- Diarrhea

HYPOTHYROIDISM

- Decreased BMR.
- Weight gain anorexia.
- Depression, psychosis, mental slowness.
- Dry skin, brittle hair.
- Bradycardia.
- Dry cold skin prone to hypothermia.
- Constipation.



Parathyroid glands:- Parathyroid glands are situated on the posterior surface of the thyroid gland. There are 4-parathyroid glands. Two – parathyroid glands are embedded in the posterior surface of each lobe of the thyroid gland. It secretes the hormone called parathyroid hormone (PTH). The (PTH) increases the amount of blood calcium when it is low. It increases the blood calcium level by increases the absorption of calcium from the small intestine and increases its reabsorption from the renal tubules. Calcium is necessary for the muscle contraction, nerve impulse transmission and blood clotting.

FUNCTIONS:-

- .Mobilization of calcium of bone into the extracellular
- .Increased reabsorption of calcium in the renal tubule.
- .Increased absorption of calcium in the gastrointestinal tract.

FUNCTIONS OF THYMUS GLAND:-

- .Production of lymphocytes .
- .thymus gland plays an important role in the sex development.

ADRENAL GLANDS:- Are also known as supra-renal glands means located superior part of the kidney. These are endocrine glands that produce a variety of hormones such as adrenaline., nor adrenaline etc. They are about 4cm long and 3cm thick. The adrenal gland can be divided into two parts which are different in structure and function. They are:-

- .Adrenal cortex
- .Adrenal medulla.

1. Adrenal cortex:- The outer part of the adrenal gland forms the adrenal cortex. It produces three hormones such as glucocorticoids, mineral corticoids and sex hormones (androgen) they are collectively called adrenocorticoids. The adrenal cortex has three distinct layers of cells .They are:-

1. Zona glomerulosa- an outer layer.
2. Zona fasciculata - a middle layer.
3. Zona reticularis - an inner layer.

These hormones are secreted by these three layers of adrenal cortex.

Adrenaline has a greater effect on heart and metabolic process whereas noradrenaline has more influence on blood vessels.

Thymus gland:- It is a gland present in the upper chest cavity on the trachea. It is present behind the sternum. It extends up to the root of the neck. It has two lobes and is covered by fibrous capsule. It weighs about 10 to 15g at birth and grows until puberty. At puberty it may weigh up to 40g. And by middle age it has returned or decreases in size to approximately its weight at birth.

Pancreatic islets:- are also called islets of Langerhans. These cells are seen in clusters that are irregularly distributed all over the pancreas. This forms the endocrine part of the pancreas and it does not have ducts leading from the cluster of islet cells. These cells secrete pancreas hormones directly into the blood stream that circulates hormones all

There are 3 main types of cells in the pancreatic islets.

1. (alpha) cells- which secrete glucagon.
2. (BETA) cells- which secrete insulin.
3. (delta) cells – which secrete somatostatin, growth hormone releasing hormone inhibiting hormone. (GHRH).

The normal blood glucose level is 60 to 140MG/100ML. Blood glucose levels are controlled mainly by the opposing actions of insulin and glycogen.

Glucagon:- Stimulates the conversion of glycogen to glucose in the liver and skeletal muscles and it also stimulates gluconeogenesis. It increases the blood glucose level when it is low.

Insulin:- Converts glucose to glycogen and reduces the blood glucose level when it is increased.

Somatostatin:- Inhibits the secretion of glucagon and insulin. It can also inhibit secretion of growth hormone from the anterior pituitary.

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