

CBSE Quick Revision Notes (Class-11 Biology)

CHAPTER-22 CHEMICAL COORDINATION AND INTEGRATION

In animals control and coordination is performed by neural system and endocrine system jointly. As the nerve fibres do not innervate all cells of the body, the endocrine or hormonal system is required to coordinate the functions.

Endocrine Glands

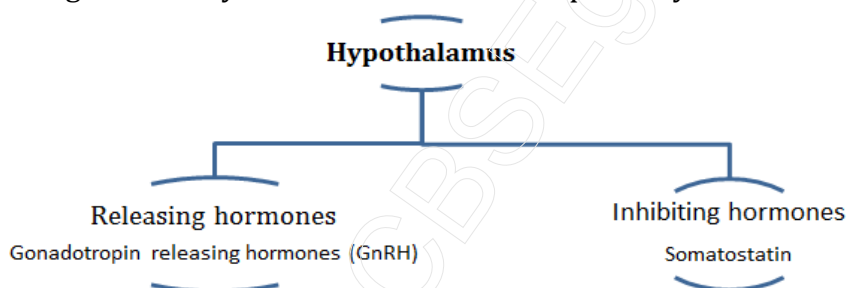
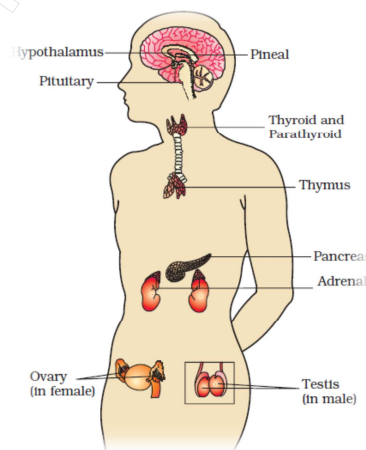
- Endocrine glands have no ducts and their secretion get absorbed into the immediate surrounding blood circulation to reach the specific organs to initiate a particular metabolic change.
- The endocrine glands secrete chemicals called hormones. Hormones are non-nutrient chemicals which act as intercellular messengers and are produced in trace amount.

Human Endocrine System

The endocrine glands and hormone producing tissues/cells are located in different parts of the body.

- Gastrointestinal tract, kidney, liver and heart also produce small quantity of hormones to control and coordinate the function of respective organs.

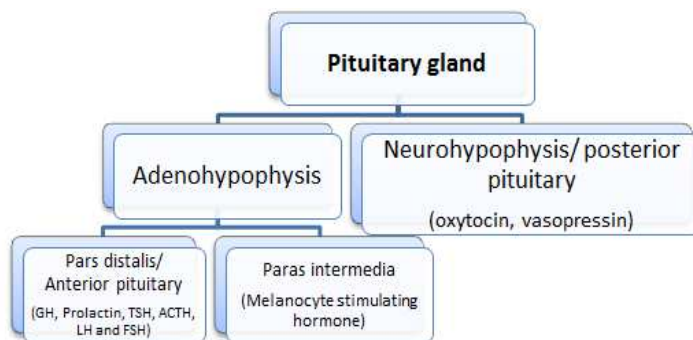
Hypothalamus contains several groups of neurosecretory cells called nuclei which produce hormones. These hormones control and regulate the synthesis and secretion of pituitary hormones.



- The hormones released from hypothalamus reaches to pituitary gland through portal circulatory system and regulate the function of anterior pituitary. The posterior pituitary is under direct control of hypothalamus.

Pituitary Gland is located in a body cavity called sella tursica and is attached to the hypothalamus by a stalk.

- Over secretion of GH (growth hormone) causes over growth of the body leading to gigantism and low secretion causes stunted growth called dwarfism.



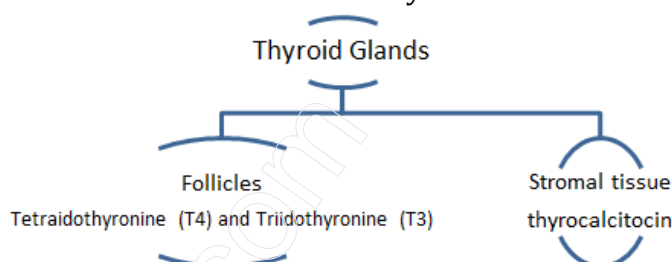
- Prolactin stimulates growth of mammary gland secretion of milk. TSH stimulates and regulates thyroid hormone.

- LH and FSH stimulates gonadal activity. In male, LH stimulates synthesis and secretion of androgen hormone from testis. In female, LH induce ovulation of fully mature ovum from ovary.
- Oxytocin helps in contraction of uterus during child birth and milk ejection from mammary glands. Vasopressin stimulates absorption of water and electrolyte in kidney.

The pineal Gland- located on dorsal side of forebrain and release melatonin hormone that help in 24-hour rhythm of body like sleeps wake cycle and body temperature.

Thyroid Gland- composed of two lobes on either side of trachea connected by isthmus.

- Iodine is essential for synthesis of thyroid hormones. Deficiency of iodine leads to hyperthyroidism (Goitre). During pregnancy, hyperthyroidism may cause stunted growth of baby and mental retardation.



Parathyroid Gland- located on the back side of thyroid gland, secretes peptide hormone called parathyroid hormone (PTH). PTH regulates the circulating level of calcium ions. It also helps in reabsorption of calcium from renal tubules and digestive tracts.

Thymus- located on the dorsal side of heart and the aorta. This gland release peptide hormone thymosins that help in differentiation of T-Lymphocytes. It also promotes production of antibodies to provide humeral immunity.

Adrenal Gland – located on anterior part of each kidney, composed of two types of tissues central adrenal medulla and outside adrenal cortex. Adrenal medulla secretes adrenaline and noradrenaline hormone together called emergency hormone. Adrenal cortex secretes many hormones together called corticoids which are involved in metabolism of carbohydrates and maintaining water and electrolyte balance.

Pancreas – acts as both endocrine and exocrine gland. Endocrine pancreas consists of “Islets of Langerhans” which contain α -cells and β -cells. The α -cells secrete hormone glucagon and β -cells secrete insulin. Both hormones are involved in maintenance of blood sugar levels.

- Glycogen is a peptide hormone that stimulates glycogenolysis resulting increased blood sugar (hyperglycemia).
- Insulin is a peptide hormone that play major role in regulation of glucose hemostasis. The rapid movement of glucose from glucose to hepatocytes and adipocytes resulting in decreased blood glucose levels (hypoglycemia).

Testis – perform dual functions as a primary sex organ as well as endocrine glands. Leydig cells or interstitial cells produce androgen mainly testosterone which regulate regulation and maturation of primary sex organs.

Ovary – produce two groups of steroid hormones called estrogen and progesterone. Estrogen is synthesized and secreted by growing ovarian follicles. After ovulation, ruptured ovum called corpus luteum, which secretes progesterone. Estrogen produces wide range actions like growth of female secondary sex organs. Progesterone regulates pregnancy.

- Atrial wall of heart secretes peptide hormone called atrial natriuretic factor (ANF) that cause blood dilution. The juxtaglomerular cells of kidney produce erythropoietin hormone which stimulate erythropoiesis.

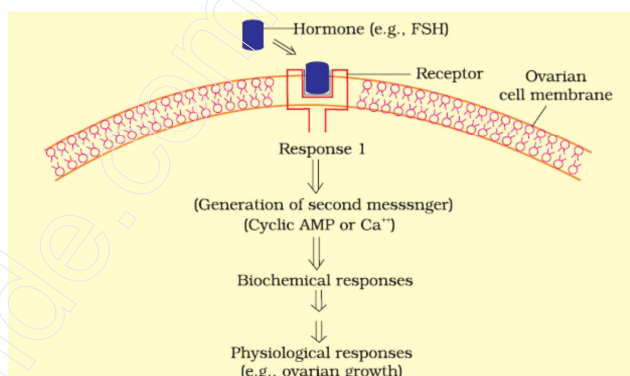
Mechanism of Hormone Action

- Hormone produce their effects on target tissues by binding to specific protein called hormone receptors located in the target tissue.
- Binding of hormones to receptor leads to the formation of hormone receptor complex. This binding leads to change in target tissue.

On the basis of chemical nature, hormones are grouped as-

1. Peptide, polypeptide and protein hormones- insulin, glucagon, pituitary hormone, hypothalamus hormones.
2. Steroids- cortisol, testosterone, progesterone.
3. Idothyronines- thyroid hormones.
4. Amino acid derivatives- epinephrine.

The hormones that bound with membrane bound receptors (steroid hormones) normally do not enter the target cells but generate second messenger which in turn regulate cellular metabolism.



The hormones (protein hormones) which interact with membrane bound receptors mostly regulate gene expression or chromosome function by interaction with hormone receptor complex with the genome. The biochemical effects results physiological and developmental effects.

