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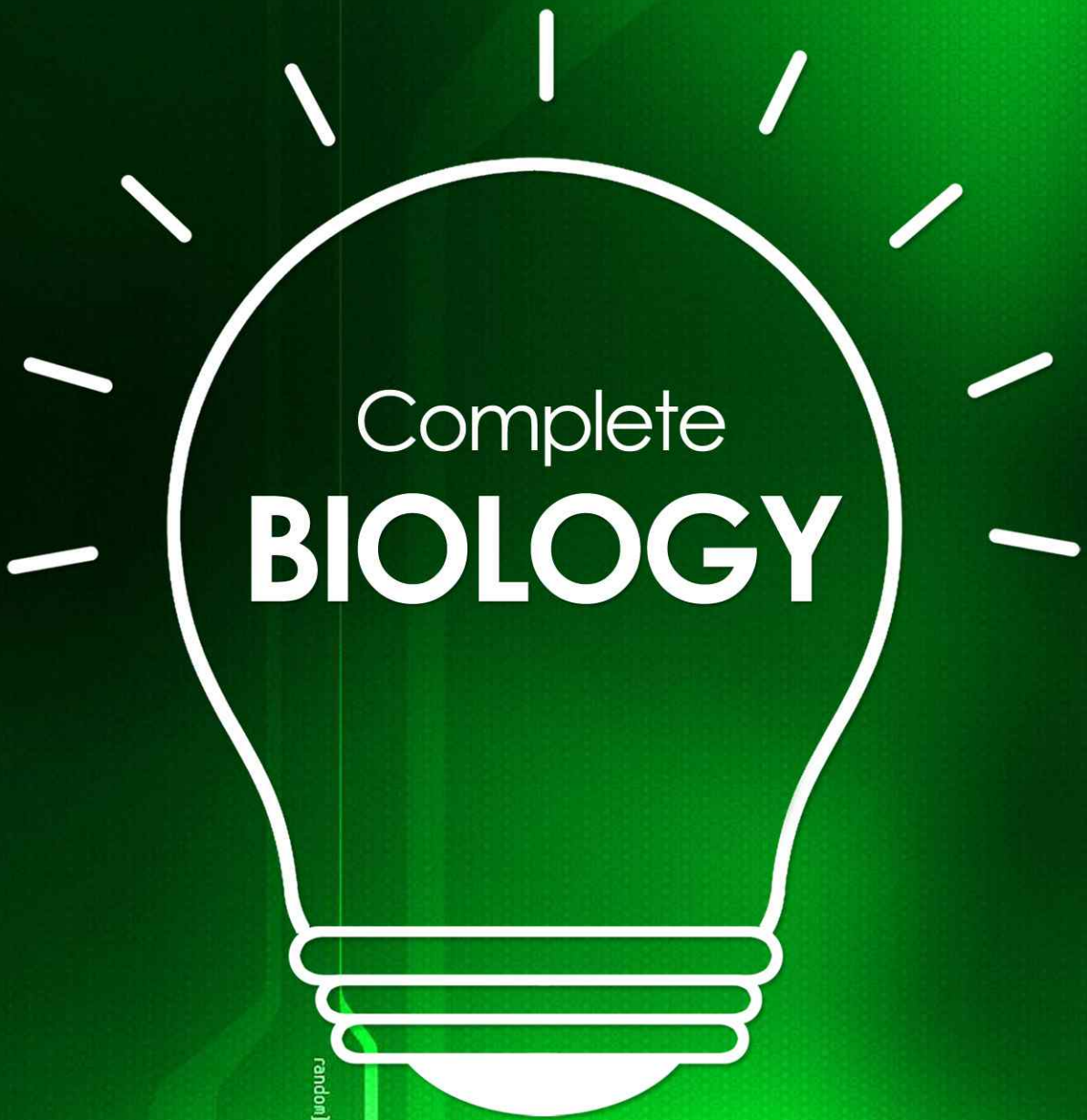

# Complete BIOLOGY

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# Chemical Coordination

## 01. Introduction

Human body consists of two independent integrating systems, i.e. nervous system and endocrine system. The nervous system plays an important role in maintaining the physical coordination among various organ systems through nerve stimulation. But, its response is short-lived. Moreover, cellular functions need to be continuously regulated. Hence, comes the need of endocrine system. This system regulates its functions through chemical messengers called **hormones.** These hormones are released directly in the blood stream to reach every cell of the body and regulates its functions. The study of endocrine glands and their secretions (hormones) is called **endocrinology.** This discipline of study was founded by WH Bayliss and EH Starling.

## 02. Hormones

These are non-nutrient chemical messengers which act as intracellular messengers and are produced in trace amounts. The term 'Hormone' was coined by Starling in 1950. According to the classical definition, a hormone is a chemical produced by the endocrine glands, released into the blood and transported to far located target tissue organs.

## 03. Chemical Nature of Hormones

Their chemical nature depends on these molecules. *The molecules and hormones derived from them are*

(i) **Iodothyronines** Thyroxine secreted from thyroid glands is an iodination thyronine.

(ii) **Amines** These are amino acid derivatives, Like melatonin (from pineal gland) and catecholamines, adrenaline and noradrenaline (from tyrosine in adrenal medulla.

(iii) **Peptides** Hypothalamic hormones, such as TRH, GRH, GIH, Intermediates (MSH); hormones of posterior lobes of pituitary, such as ADH, oxytocin, ACTH of anterior pituitary and calcitonin of thyroid gland belong the his category.

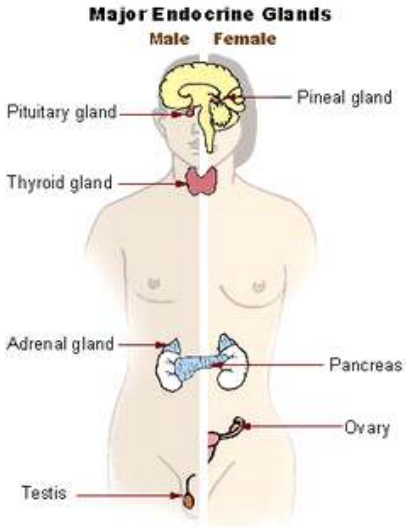
(iv) **Proteins** Hormones of pancreas like insulin and glucagon; hormones of gastrointestinal tract like PTH (parathyroid hormone); female hormones like relaxin, hCG are proteinaceous in nature.

(v) **Steroids** These are derived from cholesterol. They are hormones of adrenal cortex like aldosterone, cortisol, sex corticoids and hormones of gonads like, testosterone, oestrogen, progesterone.

## 04. Human Endocrine System

The endocrine system consists of various endocrine glands, which are widely separated from each other with no direct anatomical links.

*The endocrine glands present in our body are discussed below*




## 05. Hypothalamus

**Position** The basal part of forebrain (diencephalon) represents hypothalamus.
**Origin** It originates from embryonic ectoderm.
**Structure** It is made up of neurosecretory cells called **hypothalamic nuclei.** These produce hormones that regulate the synthesis and secretion of pituitary gland hormones.
*Hypothalamus produces following two types of hormone*

**(i) Releasing or Trophic hormones**
These stimulate the secretion of pituitary hormones. For example, a hypothalamic hormones called **Gonadotrophin Releasing Hormone** (GnRH) Stimulates the synthesis and release of gonadotrophins from the pituitary gland.

**(ii) Inhibiting hormones**
These inhibit the secretion of pituitary hormones. For example, somatostatin from the hypothalamus inhibits the release of growth hormone from the pituitary. All these hormones originate from hypothalamic neurons, pass through axons and are released from their nerve endings. The hypothalamic hormones reach the anterior pituitary region through hypophysial portal circulation. The posterior pituitary is directly regulated by hypothalamus through their nerve pathway.

**Some hypothalamic hormones and pituitary response**

| Hypothalamic hormones | Response of pituitary | Target organ |
|---|---|---|
| Thyrotropin- Releasing Hormone (TRH) | Secretes Thyroid Stimulating Hormone (TSH) | Thyroid |
| Adrenocorticotropin Releasing Hormone (ARH) | Secretes Adrenocorticotropin Hormone (ACTH) | Adrenal cortex |
| Luteinizing Hormone-Releasing Hormone (LH-RH) | Secretes Luteinizing Hormone(LH) | Ovary/Testis |
| Follicle Stimulating Hormone- Releasing Hormone (FSH-RH) | Secretes Follicle Stimulating Hormone (FSH) | Ovary/Testis |
| Growth Hormone-Releasing Hormone (GH-RH) | Secretes Growth Hormone (GH) or Somatotropic Hormone (STH) | – |
| Growth Hormone-Releasing Inhibiting Hormone or Somatostatin (SRH or GH-IH) | inhibits secretion of Growth Hormone (GH) | Most tissues |
| Prolactin-Releasing Hormone (P-RH) | Secretes Luteotropic Hormone (LTH) or Prolactin Hormone (PH) | Mammary glands |
| Prolactin- Inhibiting Hormone (P-IH) | Inhibits secretion of prolactin | |
| Melanocyte Stimulating Hormone- Releasing Hormone (MSH-RH) | Secretes Melanocyte Stimulating Hormone (MSH) | Skin pigment cells |
| Melanocyte Stimulating Hormone –inhibiting Hormone (MSH-IH) | Inhibits or secretes Melanocyte Stimulating Hormone (MSH) | |

## 06. Pituitary Glands (Hypophysis Cerebri)

The pituitary or master gland acts as a regulating unit of hormonal system. It regulates activity of most of the other endocrine glands.

**Position** It is the smallest and most protected gland of the body. It lies in the bony cavity called **hypophysial fossa** or **sella turcica** of the sphenoid bone. This gland is attached to hypothalamus by a stalk like infundibulum.