

Chapter 19

Chemical Coordination and Integration

- Endocrine Glands and Hormones
- Human Endocrine System
 - The Hypothalamus
 - The Pituitary Gland
 - The Pineal Gland
 - Thyroid Gland
 - Parathyroid Gland
 - Thymus
 - Adrenal Gland
 - Pancreas
 - Testis
 - Ovary
- Hormones or Heart, Kidney and Gastrointestinal Tract
- Mechanism of Hormone Action

ENDOCRINE GLANDS AND HORMONES

- Regulation of body functions like metabolism, growth and vital activities by some specific chemicals is called Chemical coordination and integration.
- The neural system and the endocrine system jointly co-ordinate and regulate the physiological functions in the body.
- The neural co-ordination is fast, very exact and short lived, whereas chemical co-ordination is usually slow, widespread and long lasting.

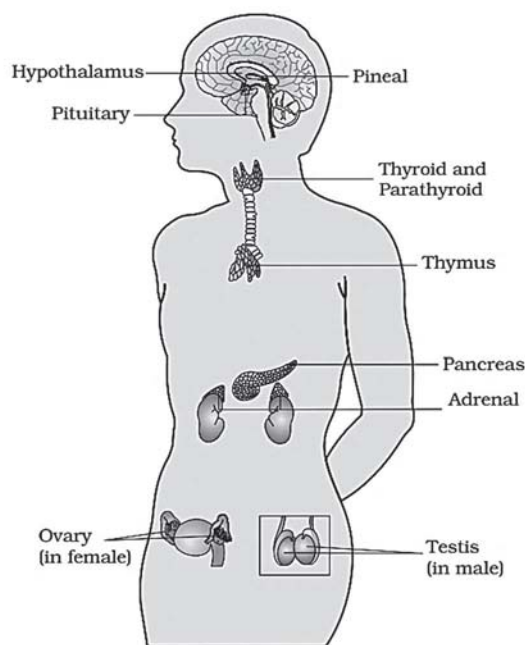


Fig. Location of endocrine glands

- All cells of our body are not innervated by nerve fibers but the cellular function needs to be continuously regulated so a special kind of coordination and integration has to be provided. This function is carried out by hormone.
- Glands on the basis of their secretions -

1. Exocrine glands are glands with ducts which secrete digestive enzyme, milk, sweat etc.
2. Endocrine glands are ductless glands and pour their secretion directly into blood. Their secretions are called hormones.
3. Heteroclit / Mixed glands: They have both exocrine and endocrine tissues.

Organized endocrine gland: Where hormone producing cells are present in cluster/tissue, they are called organized endocrine gland.

Examples: Pituitary, Pineal, Thyroid, Parathyroid, Thymus, Adrenal, Pancreas and Gonads.

Non-organized endocrine gland:

Where hormone producing cells are present in scattered form, they are called non-organized or diffused endocrine tissue.

Example: Heart, Liver, Kidney, Gastrointestinal tract.

Differences between Nervous and Endocrine Coordination

	Nervous Co-ordination		Endocrine Co-ordination (Chemical Co-ordination)
1.	Information passes as electrical impulses along nerve fibers.	1.	Information passes as a chemical substance through the blood and lymph.
2.	There is rapid transmission of information.	2.	There is slow transmission of information.
3.	Response is immediate, very exact, short lived.	3.	Response is usually slow, wide spread, long lasting.

Hormone

- Hormones are chemicals produced by endocrine glands and released into the blood and transported to a distantly placed target organs.
- First discovered hormone is Secretin. It was discovered by "Bayliss & Starling in 1902".
- The term hormone was coined by "Starling".
- Hormones are also called "Primary messengers" or "chemical messengers".
- Hormones are non-nutrient chemicals which act as intercellular messenger and are produced in trace amount.
- They do not be stored in body usually (Except thyroxine)
- Hormones are non-antigenic & non-species specific substances.
- Usually, hormones do not participate in the metabolic activities of target cells but they affect and control the activity level of these target cells.

Chemical nature of hormones :

Nature	Hormone	Gland
A. Proteinaceous	Thyroxine (Idothyronine)	Thyroid gland Adrenal medulla
1. Amino acid derivatives	Epinephrine Non-epinephrine	
2. Short peptides	Vasopressin, Oxytocin MSH	Hypothalamus adenohypophysis
3. Long peptides	Parathyroid hormone Insulin Thyrocalcitonin ACTH	Parathyroid Pancreas Thyroid Adenohypophysis
4. Glycol-Proteins	TSH, FSH, LH	Adenohypophysis
B. Steroids	Mineralocorticoids Glucocorticoids Testosterone Oestrogen Progesterone	Adrenal cortex Adrenal cortex Testes Ovary

Physical & Chemical Specialties of hormones :-

- The molecules of most of the hormones are small, and their molecular weight is low
- Mostly hormones are soluble in water and few are soluble in fat and are easily diffusible in tissues.
- The secretion of hormone is always-in very small quantity because these are very reactive substances.
- Hormones are destroyed after use i.e. hormones can not be stored in the body.
- Thyroxine is exception in this regards.
- Liver and kidneys separate hormones from blood and decompose them. The product formed after decomposition is excreted with urine. It can not be reutilized.
- Hormones are non-antigenic & non-species specific substances.
- Usually, hormones do not participate in the metabolic activities of target cells but they affect and control the activity level of these target cells.