

# LECTURE NO.1

## INTRODUCTION TO ENDOCRINE SYSTEM

- The endocrine system **consists of many ductless glands which secrete hormones directly into the blood stream.** These hormones affect processes like metabolism, sex drive etc.
- **Nervous system is wired control system of the body** whereas endocrine system is the wireless control system
- **A hormone is a specific chemical messenger molecule synthesized and secreted by an endocrine gland or a group of specialized cells.**
- These glands are ductless, which means that their secretions (hormones) are released directly into the blood stream and travel to elsewhere in the body to target organs, upon which they act.
- These are in contrast to other types of glands in the body such as salivary and sweat glands, which have ducts for carrying the secretions to the points/locations of action.

## ENDOCRINOLOGY

- A science dealing with ductless (endocrine) glands. Greek word "endo" (within) + "krinein" (separate)
- Modern (broad) definition of endocrinology - the study of the adjustments of homeostatic and other activities accomplished by chemical messengers.

• ENDOCRINE GLANDS IN THE BODY

s	Endocrine gland	Location / description of the endocrine gland	Major hormones secreted	Chemical class
1	Hypothalamus	<ol style="list-style-type: none"> <li>1. Part of the brain that acts as the main control center for the autonomic nervous system</li> <li>2. re-establishes homeostasis and</li> <li>3. coordinates the endocrine system</li> <li>4. Often called the “<b>master gland</b>” because it secretes hormones that control other endocrine glands</li> </ol>	<ol style="list-style-type: none"> <li>1. GHRH,</li> <li>2. TRH,</li> <li>3. CRH,</li> <li>4. GnRH,</li> <li>5. Somatostatin,</li> <li>6. PIF(Prolactin inhibiting factor)</li> </ol>	Peptide
2	Anterior pituitary	Located in the ' <b>sella turcica</b> ' at the <b>base of the brain</b>	STH or GH, Prolactin, TSH, ACTH, FSH, LH	Polypeptide/protein
3	Posterior pituitary	Neurological origin. Does not synthesize any hormones but releases two hormones which are synthesized in the hypothalamus	Oxytocin, Vasopressin/ADH	Peptide
4	Thyroid gland	“ <b>Butterfly - shaped</b> ” <b>gland located on</b>	Thyroxine Tri-iodothyronin	Amino acid derived

		<b>either side of 1<sup>st</sup> and 2<sup>nd</sup> tracheal rings in the neck</b>	Calcitonin	Polypeptide
5	Parathyroid	Located on the back of the thyroid gland	PTH	Polypeptide
6	Pancreas	Islets of Langerhans	Insulin Glucagon, Somatostatin, Pancreatic polypeptide	Protein
7	Adrenal gland	Located like a cap at the cranial border of the kidneys	Glucocorticoids, Mineralocorticoids Sex steroids	Steroids
			Epinephrine Norepinephrine	Amine
8	Ovaries	Primary reproductive organs of a female	Estrogen, Progesterone	Steroids
			Inhibin, Relaksin, Activin, Follistatin, Oxytocin, GFs, etc.	Protein
9	Testes	Male reproductive organ that produce sperm. Located in the scrotum outside the abdominal cavity in most mammals” and <b>within the abdominal cavity in birds</b>	Testosterone	Steroids
			Inhibin	Protein
1	Thymus	Located between the lobes of the lungs in the upper chest cavity	Thymosin	Peptide
1	Pineal gland	<b>Small pine cone -</b>	Melatonin	Amine

		<b>shaped structure located deep in the center of the brain</b>		
1	Heart	Located in the thoracic cavity	Atrial natriuretic peptide	Polypeptide
1	Kidney	Located in the abdominal cavity at sub lumbar level	Erythropoietin	Polypeptide
1	GI tract	Located in the abdominal cavity	Gastrin Secretin Cholecystokinin	Polypeptide
1	Placenta	Temporary endocrine gland, located within the uterus during gestation	1. Progesterone	Steroids
			2. Estrogen	
			3. hCG	Glycoprotein
			4. PMSG	
			5. Protein B	
			6. Relaxin	Polypeptide
			7. Placental lactogen	

## GENERAL FUNCTIONS OF ENDOCRINE SYSTEM

- Maintain homeostasis
- Control chemical and water balance in body
- Control growth and metabolism
- Control embryonic development and preparation for nursing a newborn
- Influence sexual behavior, stimulate growth and maturation of the genitalia
- Feedback to the nervous system
- Regulating red cell production
- Inducing adaptive changes to stress

## INTER-RELATIONSHIP BETWEEN ENDOCRINE AND NERVOUS SYSTEM

- The nervous system controls homeostasis through nerve impulses that trigger the release of neurotransmitters whose effect results in either excitation or inhibition of other neurons, muscle fibres, or glands.
- The endocrine system releases hormones into blood stream that travels to the target organ where it **alters the physiological activity**.
- In nervous system, a sensory receptor senses the change and sends action potentials by its afferent sensory neuron to the integration center in the brain or spinal cord. The efferent path is the motor neuron that takes action potentials to the effectors (muscle or glands) for the response of contraction or secretion.
- In the endocrine system, the gland/ the cells may act as the receptors and the integration centres which are often influenced by neural and other inputs. The response is either to change the rate of an enzymatic reaction, to control the transport of certain molecules across cell membranes, or to control gene expression and thus make new proteins.

<b>Nervous system</b>	<b>Endocrine system</b>
<ul style="list-style-type: none"> <li>Nervous system regulates the activities of muscles and glands via electrical impulses transported through neurons</li> </ul>	<ul style="list-style-type: none"> <li>Endocrine System regulates the body's metabolic activity via hormones that are transported in the blood</li> </ul>
<ul style="list-style-type: none"> <li>Reflexes of the nervous system are more specific because nerves regulate specific target cells</li> </ul>	<ul style="list-style-type: none"> <li>Hormones can control multiple organs and systems</li> </ul>
<ul style="list-style-type: none"> <li>Nervous system uses both electrical (action potentials) and chemical (neurotransmitters) signals</li> </ul>	<ul style="list-style-type: none"> <li>Endocrine system uses only chemical signals (hormones)</li> </ul>
<ul style="list-style-type: none"> <li>Neural control is fast; its effects are short-lived</li> </ul>	<ul style="list-style-type: none"> <li>Hormonal control is comparatively slower; generally its effects are prolonged</li> </ul>
<ul style="list-style-type: none"> <li>Stimulus intensity in the nervous system is represented by the frequency and amplitude of action potentials.</li> </ul>	<ul style="list-style-type: none"> <li>Stimulus intensity in the endocrine system is determined by the amount and duration of hormone(s) released.</li> </ul>