

## Quadrant II – Transcript and Related Materials

**Programme: Bachelor of Science (Third Year)**

**Subject: Zoology**

**Paper Code: ZOC 105**

**Paper Title: Endocrinology**

**Unit: III: Hormones**

**Module Name: Hormones: Introduction, Chemical messengers, Types of  
Chemical Messengers I**

**Module No: 11**

**Name of the Presenter: Dr. Deeparani Prabhu**

---

### Notes

#### Hormones:

**Introduction:** With the advent of multicellularity during the course of evolution a need for coordination between the cells was felt. In the metazoans like coelenterates a nerve net arose for this purpose. For long this process of coordination was thought to be the exclusive regulation of the Nervous system.

As the complexity grew across the vertebrates, subsequent discoveries have unravelled a gamut of chemical messengers which maybe exclusive & somewhat autonomous, independent of the nervous system.

#### Types of co-ordination:

- 1. Nervous System:** Coordination by neurons via the neurotransmitters that are released and travel only across the synaptic cleft/ neuromuscular junction.
- 2. Endocrine System:** Classically the endocrine coordination brought about by chemicals called hormones secreted by ductless glands into the blood stream.
- 3. Neuroendocrine System:** It is now known that the nervous and endocrine systems work

together as an all-encompassing communicative and integrative network called the neuroendocrine system.

Here the feedback systems regulate chemical messengers in their short and long-term coordination of animal body function to maintain homeostasis.

**Homeostasis** is the state of steady internal, physical and chemical conditions maintained by the cells and tissues of the living systems. It is required for optimal functioning of the organism and has many variables like body temperature, fluid balance pH of extracellular fluid.

It is a result of complex interplay, interaction & interdependence of several independent processes. Operates by a number of mechanisms.

### **Chemical Coordination:**

**Discovery of Secretin: Bayliss and Starling (1902)** discovered a chemical substance “Secretin” which was subsequently referred to as a hormone.

Secretin is released from the small intestine when food enters the stomach.

They demonstrated a chemical communication between the intestinal walls & the exocrine pancreas giving rise to the alkaline secretion from the latter to neutralize the acidic chyme without involvement of the nervous system.

Starling coined the term “**hormone**” to describe Secretin, from the Greek root hormone = “to excite or set in motion.”

### **Definition of Hormone:**

Hormones are generally considered to be chemical messengers that are released from cells into the blood stream to exert an action on target cells some distance away.

**Guillemin** has defined hormone as any substance released by a cell and which acts on another cell near or far, regardless of the singularity of ubiquity of the source and regardless of means of conveyance, blood stream, axoplasmic flow or immediate intercellular space.

**Schally and Guillemin** shared the 1977 Nobel Prize in Medicine for their discoveries concerning the peptide hormone production of the brain.

### **Chemical messengers:**

**Chemical messenger** is any substance produced by a cell that plays a physiological role in the control of the activity of another cell.

**Hormone** is any substance elaborated by one cell to regulate another cell and may be delivered in an endocrine, paracrine, autocrine or pheromonal route.

## **Classification based on mode of delivery:**

**Endocrine** where the messenger is blood-borne and is at a distance from the target cell. The chemical messengers released from endocrine cells are called hormones. Eg.: Anterior lobe of Pituitary secretes Adrenocorticotrophic hormone (ACTH) which stimulates the Adrenals to produce cortisol when in stress. Pituitary is located in the brain i.e. the head region whereas the adrenal glands are located above the kidneys.

**Neuroendocrine** where the peptide hormone released by a nerve is blood borne so that they can stimulate target cells that are at a distance. Eg.:Posterior pituitary releases oxytocin which acts on the target cells in the uterus.

**Paracrine** where the released hormone diffuses to adjacent target cells through the immediate extracellular space. Eg.: Hormones of Gastrointestinal tract.

During a tissue inflammatory response Prostaglandins and leukotrienes are generated locally and act in a paracrine fashion.

A special type of paracrine signaling also called **Neurocrine** is the transfer of signal across synapse between two subsequent neurons.

**Autocrine** where the hormone may feedback to the cell of origin to regulate its own release.

Eg. Differentiation of cells into identical cell types during embryonic development.

**Intracrine:** where the chemical messengers are produced inside the cell and bind directly to intracellular receptors without actually leaving the cell. Eg.: fibroblast growth factor is formed inside the cell and interacts with the receptors inside the cell and isn't released outside the cell.

## **Types of Chemical Messengers:**

1. Neurohormones
2. Neurotransmitters
3. Neuropeptides
4. Nonpeptidergic messengers
5. Lumones
6. Chalone
7. Local chemical messengers
8. Hormones
9. Pheromones
10. Growth factors
11. Eicosanoids