



UNIT-4 CLASSIFICATION OF HORMONES , MECHANISM OF HORMONE ACTION

CLASSIFICATION OF HORMONES

Based on **chemical nature**, hormones are classified into three types

- ❖ Steroid hormones
- ❖ Protein hormones
- ❖ Derivatives of tyrosine

Steroid hormones

Steroid hormones are the hormones synthesized from cholesterol or its derivatives. Steroid hormones are secreted by adrenal cortex, gonads and placenta.

Eg: Cortisol, Estrogen, Progesterone, Aldosterone.

Protein hormones

Protein hormones are large or small peptides. Protein hormones are secreted by pituitary gland, parathyroid glands, pancreas and placenta.

Eg: ADH, LH, Oxytocin, Parathormone, Calcitonin, Insulin, Glucagon

Tyrosine derivatives

Two types of hormones, namely thyroid hormones and adrenal medullary hormones are derived from the amino acid tyrosine.

Eg: Thyroxine (T4), Triiodothyronine (T3), Adrenaline, Noradrenaline, Dopamine.

HORMONAL RECEPTOR:

Hormone does not act directly on target cells. It combines with receptor present on the target cells and forms a **hormone-receptor complex**. This hormonereceptor complex induces various

changes or reactions in the target cells. Each cell has thousands of receptors and each receptor is specific for one single hormone.

Situation of the Hormone Receptors

1. Cell membrane: Receptors of protein hormones and adrenal medullary hormones (catecholamines) are situated in the cell membrane.

2. Cytoplasm: Receptors of steroid hormones are situated in the cytoplasm of target cells.

3. Nucleus: Receptors of thyroid hormones are in the nucleus of the cell.

- When a hormone is secreted in excess, the number of receptors of that hormone decreases due to binding of hormone with receptors. This process is called **down regulation**.
- During the deficiency of the hormone, the number of receptor increases, which is called **upregulation**.
- Hormone in the form of hormone-receptor complex enters the target cell by means of endocytosis and executes the actions. The whole process is called **internalization**.
- After internalization, some receptors are recycled, whereas many of them are degraded and new receptors are formed.
- Formation of new receptors takes a long time. So, the number of receptors decreases when hormone level increases.

MECHANISM OF HORMONAL ACTION:

Hormone-receptor complex executes the hormonal action by any one of the following mechanisms:

- ❖ By altering permeability of cell membrane
- ❖ By activating intracellular enzyme
- ❖ By acting on genes.

By altering permeability of cell membrane

- Neurotransmitters in synapse or neuromuscular junction act by changing the permeability of postsynaptic membrane.

- For example, in a neuromuscular junction, when an impulse (action potential) reaches the axon terminal of the motor nerve, acetylcholine is released from the vesicles.
- Acetylcholine increases the permeability of the postsynaptic membrane for sodium, by opening the ligand-gated sodium channels.
- So, sodium ions enter the neuromuscular junction from ECF through the channels and cause the development of endplate potential.

By activating intracellular enzyme:

- Protein hormones and the catecholamines act by activating the intracellular enzymes.
- The hormone which acts on a target cell, is called first messenger or **chemical mediator**. It combines with the receptor and forms hormone-receptor complex.
- Hormone-receptor complex activates the enzymes of the cell and causes the formation of another substance called the second messenger or **intracellular hormonal mediator**.
- Second messenger produces the effects of the hormone inside the cells. Protein hormones and the catecholamines act through second messenger. Most common second messenger is cyclic AMP.
- Cyclic AMP, cAMP or cyclic adenosine 3'5'- monophosphate acts as a second messenger for protein hormones and catecholamines.

