Chemical coordination

Chemical Coordination:

Communication through chemical signals.

Four types of chemical signal.

- **Autocrine** :- stimulate self-cell.
- **Paracrine** :- neighboring cell.
- **Endocrine** :- Distant cell.
- **Pheromones** :- Other organism

  Example : Ants.

Endocrine system.

In higher organism chemical coordination is by hormones.

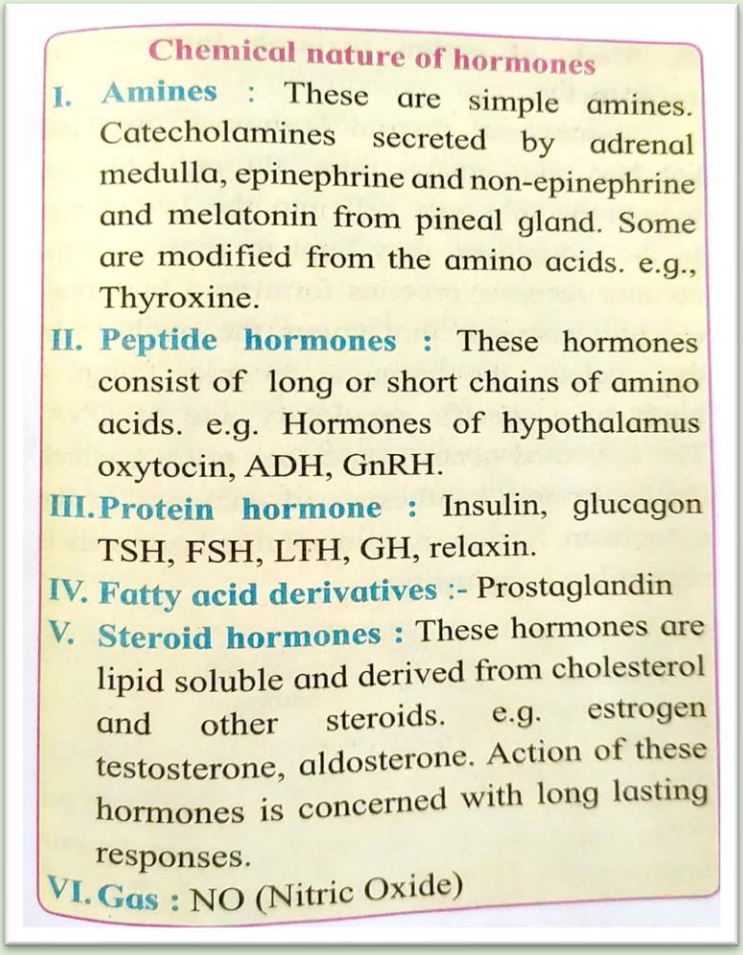
Hormone :- secretion of endocrine gland.

Endocrine gland:- ductless gland.

Definition of hormone:-

Organic compound secreted by endocrine gland which stimulate the cell to carry out specific function.

Chemical nature of hormone.



Chemical nature of hormones

I. **Amines** : These are simple amines. Catecholamines secreted by adrenal medulla, epinephrine and non-epinephrine and melatonin from pineal gland. Some are modified from the amino acids. e.g., Thyroxine.

II. **Peptide hormones** : These hormones consist of long or short chains of amino acids. e.g. Hormones of hypothalamus oxytocin, ADH, GnRH.

III. **Protein hormone** : Insulin, glucagon TSH, FSH, LTH, GH, relaxin.

IV. **Fatty acid derivatives** :- Prostaglandin

V. **Steroid hormones** : These hormones are lipid soluble and derived from cholesterol and other steroids. e.g. estrogen testosterone, aldosterone. Action of these hormones is concerned with long lasting responses.

VI. **Gas** : NO (Nitric Oxide)

Properties of hormone.

- Hormones act as chemical messenger.
- Required in small quantity.
- Regulator stimulate/ inhibit/modify specific process.
- Interact with receptor present on plasma membrane or some enters the nucleus to interact with gene.
- Metabolized after their function is over, cannot reused.
- Hypo/hyper secretion causes diseases
- Regulated by positive and negative feedback mechanism.

Mechanism of hormonal action.

- Small amount induced on target cell.
- Binds to receptor.
- receptor two types:

  a] on cell membrane

  b] Intracellular (in cytoplasm)

A: --Through membrane receptor.

- Water soluble, non-steroidal (insoluble in fats) enter through plasma membrane.
- They bind to receptor on plasma membrane and initiate metabolic activity.

Process: -

Amino acid binds to receptor molecule.

⬇

Formation of hormone receptor complex.

⬇

Release enzyme adenylate cyclase.

⬇

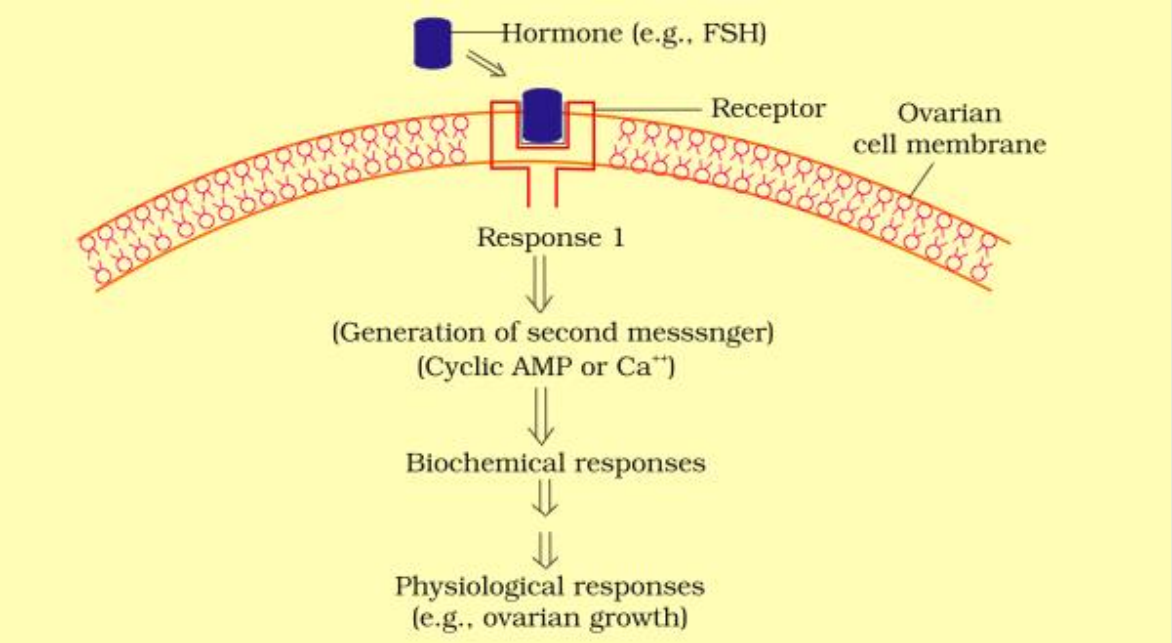
ATP----- cAMP.

⬇

cAMP activate enzyme action.

(Note: Hormone is first messenger.

Ca++, cGMP, IP3 second messenger**)**



Hormone Action Through Membrane Receptor

Action through intracellular membrane.

- Steroids fat soluble and thyroid hormone.
- Receptor are present in cytoplasm.

Hormone enters in cytoplasm and form hormone receptor complex.

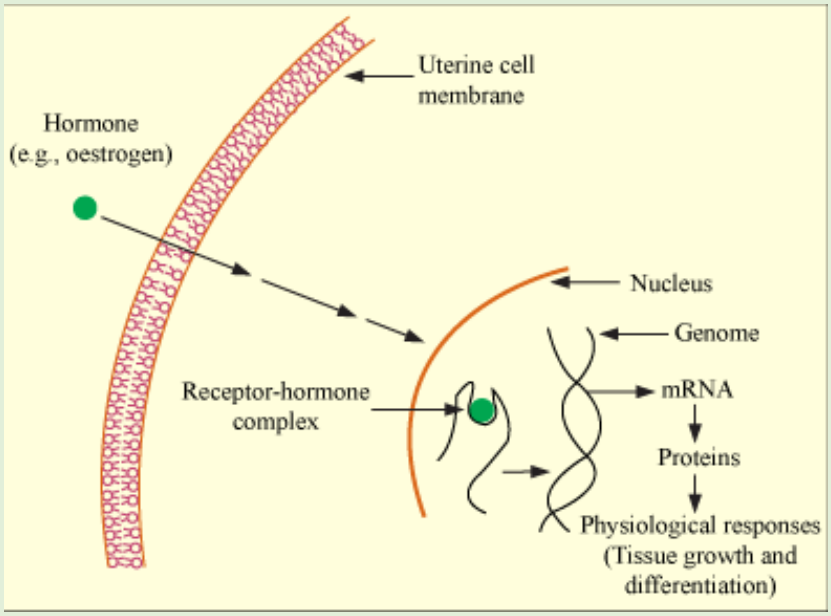
⬇

Enter in nucleus and binds to DNA.

⬇

DNA—mRNA—protein/enzyme – metabolism.

(**Note:** Effect is slow and long lasting.)



Hormone Action Through Intracellular Receptor