University of Mosul
Lecture No.: 2
College of Veterinary Medicine
Date:
Unit of Scientific Affairs
Website:

Lecture title: **The Endocrine System (Classification of the hormones)**

Lecturer Affiliation: **Prof Dr. Fadwa AMEEN AGHA**

Faculty of Veterinary Medicine, University of Mosul

Summary: **The 2nd lecture is a review of the hormone's classification based on their chemical structure into three main types: peptide hormones, steroid hormones, and amine hormones. They can also be categorized by their function, such as regulatory, growth-promoting, or metabolic hormones.**

Classification of Hormones:

Hormones are chemically classified into **3** categories according to their biochemical structure

1-Peptides & proteins
2-Amines
3-Steroids

***1- Peptides and proteins hormones*:** including hormones of

1-hypothalamus
2-anterior pituitary
3-posterior pituitary
4-pineal gland
5-pancreas
6-parathyroid gland
7-gastrointestinal tract
8-kidney
9-liver
10-thyroid c-cells
11-heart.

The peptide & protein hormones consist of specific amino acids arranged in a chain of varying length, the shorter chains are peptides, and the longer ones are proteins.

Most hormones fall into these categories:

1- Peptides Hormones

"Chains" of amino acids 4 – 200 amino acids include hormones of

» Hypothalamus

» Pituitary (anterior & Posterior)
» Islets of Langerhans
» Parathyroid hormone
» Digestive system hormones

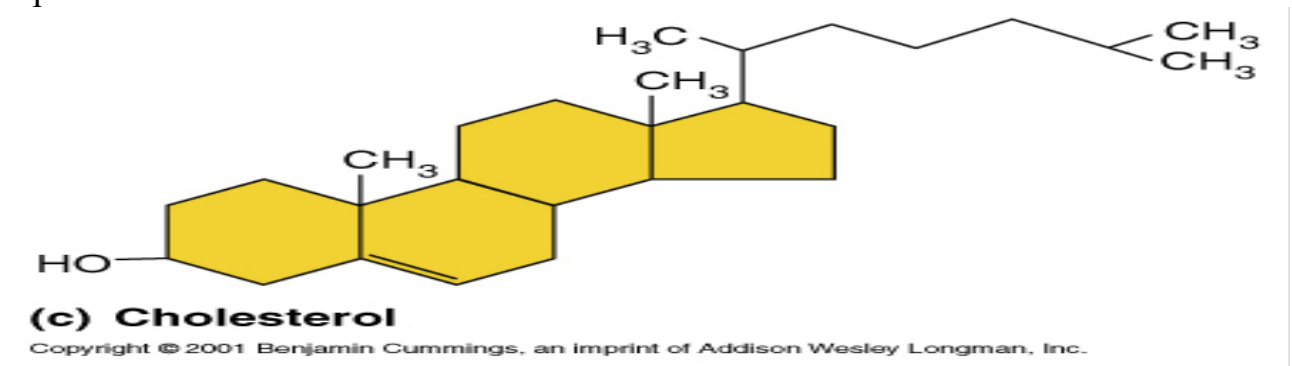
2- Amine's hormones are derived from the amino acid tyrosine: include the hormones secreted by
1-thyroid gland
2-adrenal medulla, the adrenomedullary hormones known as catecholamines.

Thyroid hormones
» Thyroxine (T4)
» Triiodothyronine (T3)

Adrenal medulla hormones
» Epinephrine
» Norepinephrine

Usually, neurotransmitters

3- Steroids Hormones: which include the hormones secreted by
1- adrenal cortex
2-gonads
3-placental hormones



(c) Cholesterol

The chemical properties of a hormone, most notably, its solubility determine how the hormone is:
1-synthesized
2-secreted
3-stored
4-the way it's transported in the blood
5-the mechanism by which it exerts its effects at the target cell.
The following differences in the solubility of the various types of hormones are critical to their functions

»»**All peptides & catecholamines hormones are hydrophilic** (water-loving), and lipophilic (lipid-fearing), that is, they are highly water soluble and have low lipid solubility.

»»**All steroid &thyroid hormones are lipophilic** (lipid –loving) and hydrophobic (water-fearing), that is, they have high lipid solubility and are poorly soluble in water.

Mechanisms of Hormone Action:

Even though hormones are distributed throughout the body by the blood, **only specific target cells can respond to each hormone** because only the target cells possess receptors for binding with the particular hormone.

Binding a hormone with its specific target cell receptors initiates a chain of events within the target cells to bring about the hormones final effect.

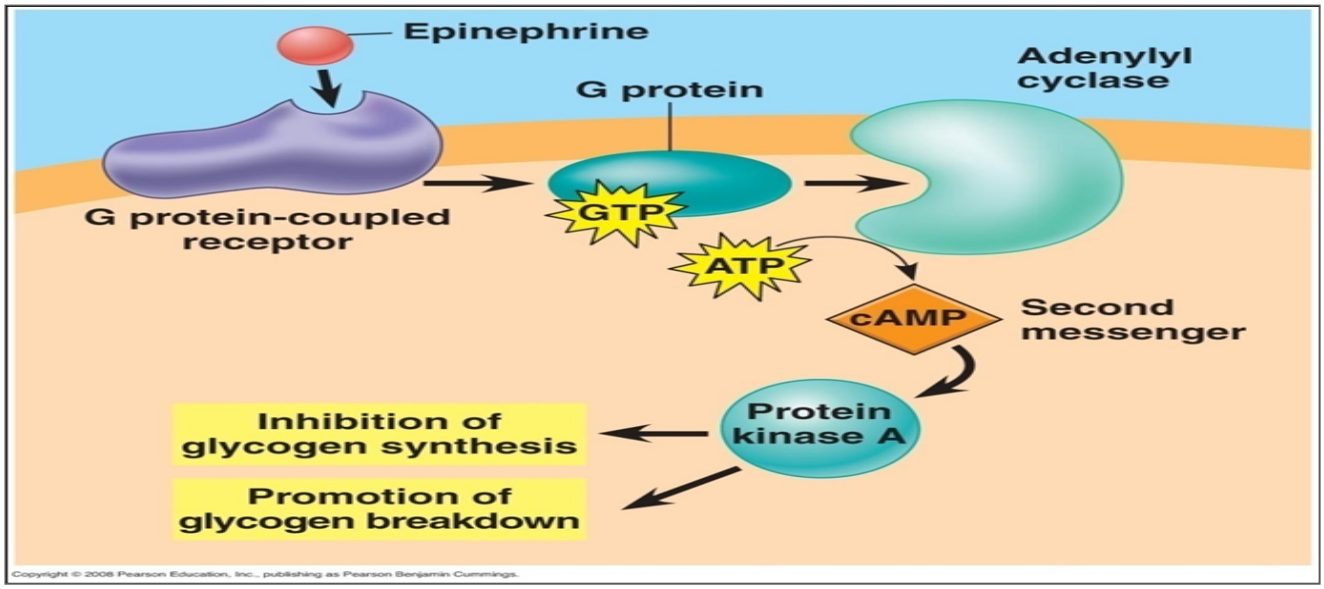
Hormones can be grouped into 2 categories based on the location of their receptors:

1-The hydrophilic peptides & catechol amines bind with specific receptors on the outer plasma membrane surface of the target cells.

2-The lipophilic steroids &thyroid hormone easily pass through the surface membrane to bind with specific receptor located inside the target cell.

Peptide & water-soluble hormones mechanism of action:

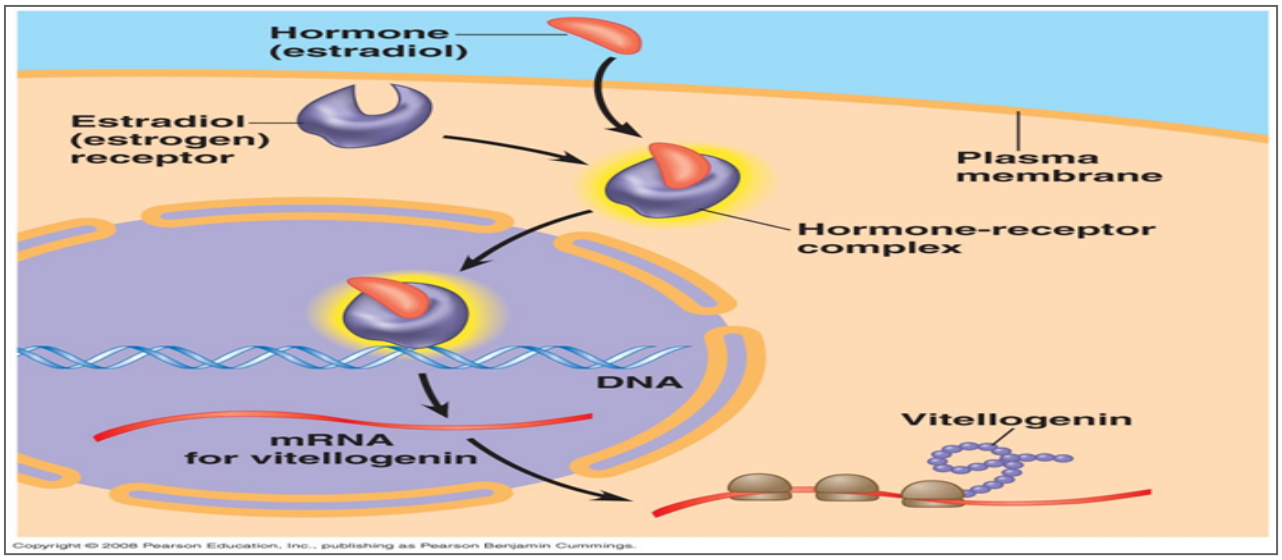
Hormone (1) bind to receptor on cell membrane
-Activates G-protein
-G- protein activates adenylate cyclase
-Converts ATP to cAMP
-cAMP activates protein kinases, which produce final effect.



Mechanisms of lipid-soluble steroids hormone action:

Diffuse through plasma membrane

- Forms "hormone-receptor complex"
- Enter nucleus
- H-R complex binds to chromosome to activate/inactivate gene(s).



All hormones ultimately influence their target cells by altering the cells protein activity.

Hormones exert an effect on their target cells proteins through 3 general means:-

1-Afew hydrophilic hormones, upon binding with a target cells surface receptors **,bring about changes in the cells permeability** (either opening or closing channels to one or more ions **or** by altering the conformation (shape) of adjacent channel –forming proteins already present in the membrane).

2-Most surface – binding hydrophilic hormones function by **activating second messenger systems** within the target cell.

3-All lipophilic hormones function **by activating specific genes** in the target cell to cause the formation of new intracellular proteins, which in turn produce the desired effect.

The activation directly alters the activity of preexisting intra cellular proteins, usually enzymes, to produce the desired effect.