Classification of Hormones

Presented by

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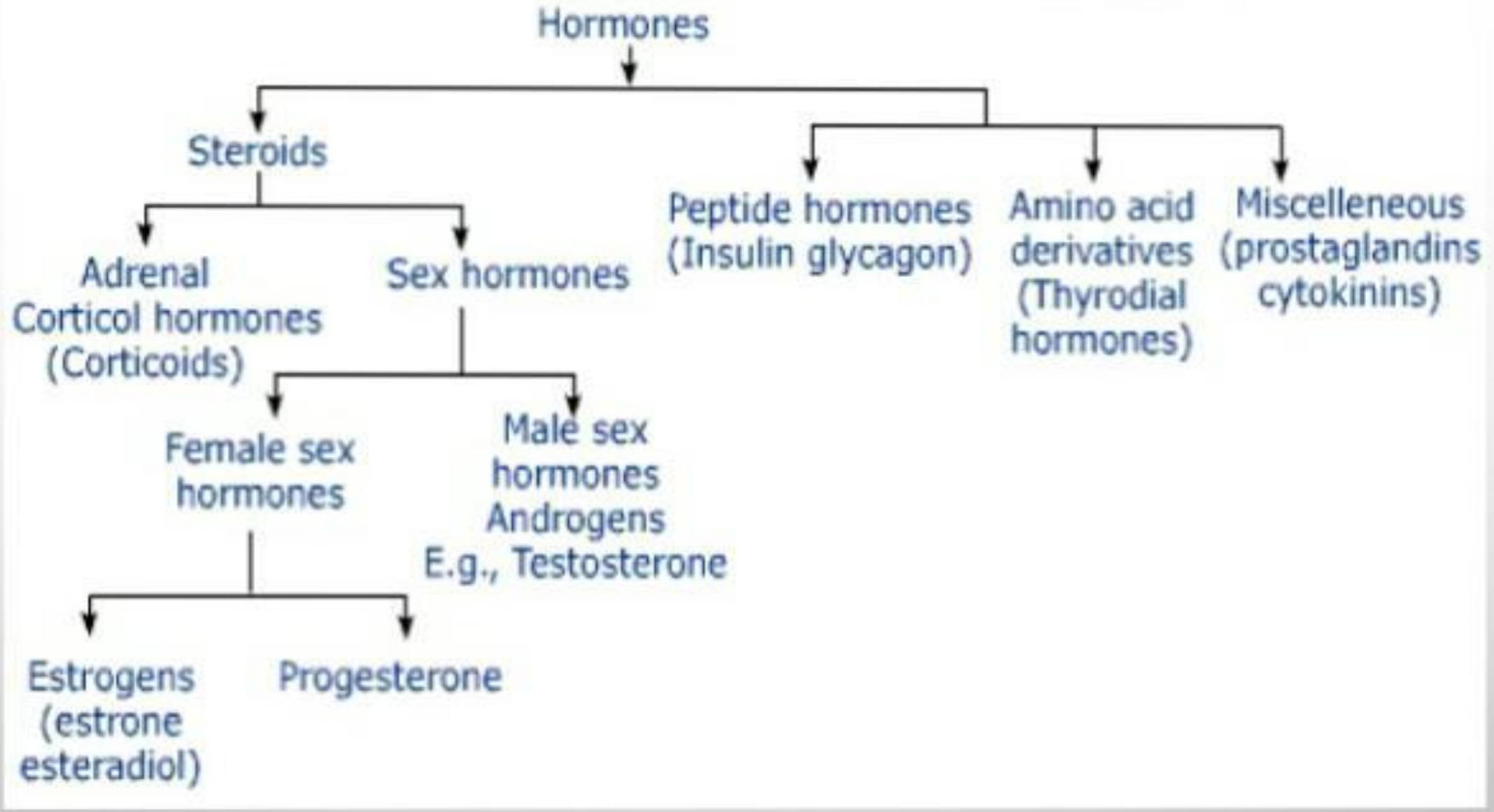
Hormones – organic biologically active compounds of different chemical nature that are produced by the endocrine glands, enter directly into blood and accomplish humoral regulation of the metabolism of compounds and functions on the organism level.

Hormonoids (tissue hormones) – compounds that are produced not in glands but in different tissues and regulate metabolic processes on the local level, but some of them (serotonin, acetylcholine) enters blood and regulate processes on the organism level.

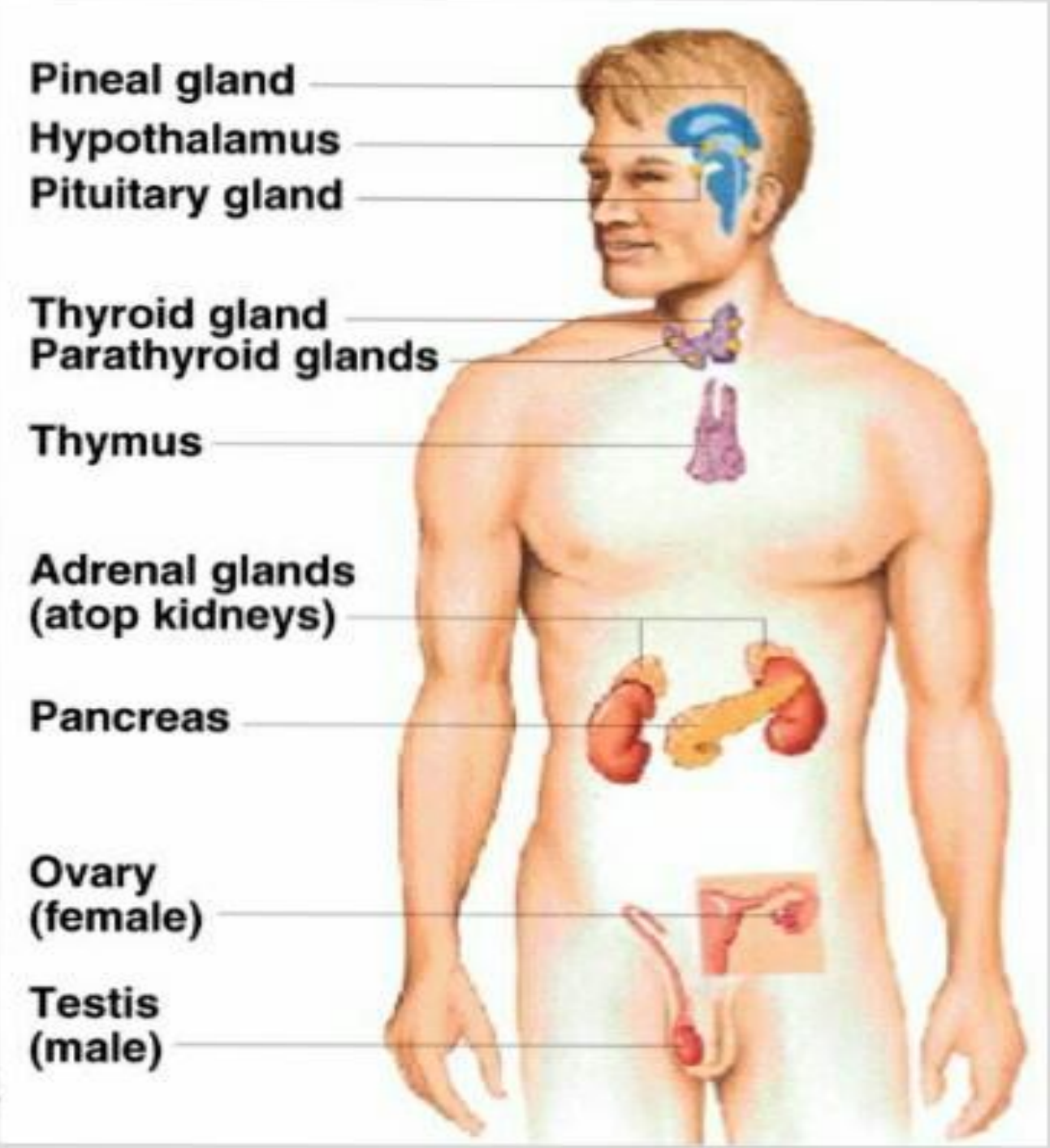
Specific stimulus for hormones secretion is:

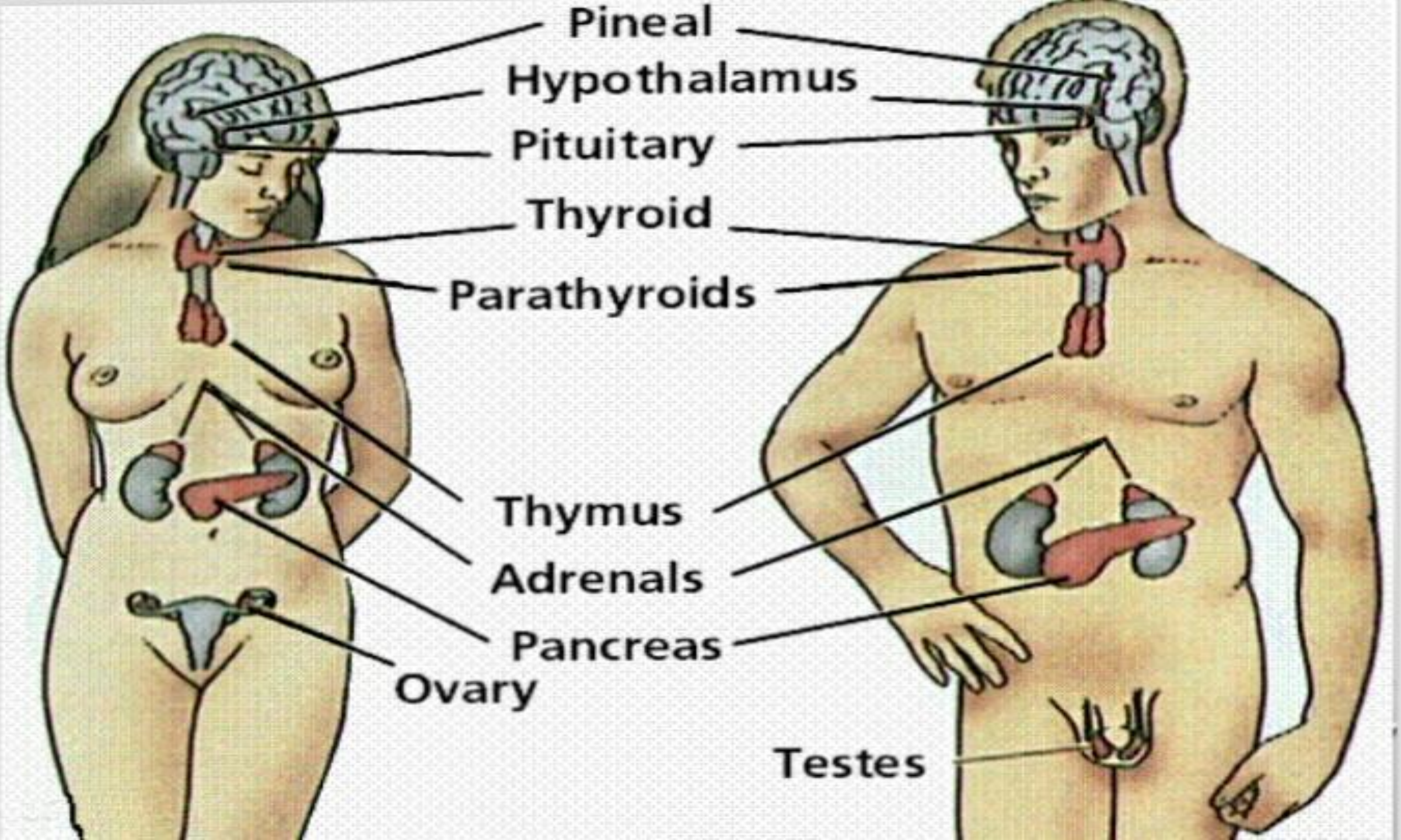
- nervous impulse
- concentration of the certain compound in blood passing through the endocrine gland


Hormones
Steroids
Peptide hormones (Insulin glycagon)
Amino acid derivatives (Thyrodial hormones)
Miscelleneous (prostaglandins cytokinins)
Adrenal Corticol hormones (Corticoids)
Sex hormones
Female sex hormones
Male sex hormones Androgens E.g., Testosterone
Estrogens (estrone esteradiol)
Progesterone

Endocrine glands:

1. Hypothalamus
2. Pituitary
3. Epiphysis
4. Thymus
5. Thyroid gland
6. Parathyroid glands
7. Langergans' islands of pancreas
8. Epinephrine glands
9. Sex glands




Pineal
Hypothalamus
Pituitary
Thyroid
Parathyroids
Thymus
Adrenals
Pancreas
Ovary
Testes

Classification of hormones according to chemical nature

1. ***Proteins:*** hormones of anterior pituitary (except ACTH), insulin, parathyroid hormone.

2. ***Peptides:*** acth, calcitonin, glucagon, vasopressin, oxytocin, hormones of hypothalamus (releasing factors and statins).

3. ***Derivatives of amino acids:*** catecholamins (epinephrine and norepinephrine), thyroxin, triodthyronin, hormones of epiphysis.

4. ***Steroid (derivatives of cholesterol):*** hormones of the cortex of epinephrine lands, sex hormones.

5. ***Derivatives of polyunsaturated fatty (arachidonic) acids:*** prostaglandins.

Fate of hormones in the organism

- Are secreted directly into the blood
- Peptide and protein hormones are secreted by exocytosis
- Steroid (lipophilic) hormones continuously penetrate the membrane (they are not accumulated in cells, their concentration in blood is determined by the speed of synthesis)

Transport of hormones in blood

Protein and peptide nature – in free state

Steroid hormones and hormones of thyroid gland – bound with alpha-globulins or albumins

Catecholamines – in free state or bound with albumins, sulphates or glucuronic acid

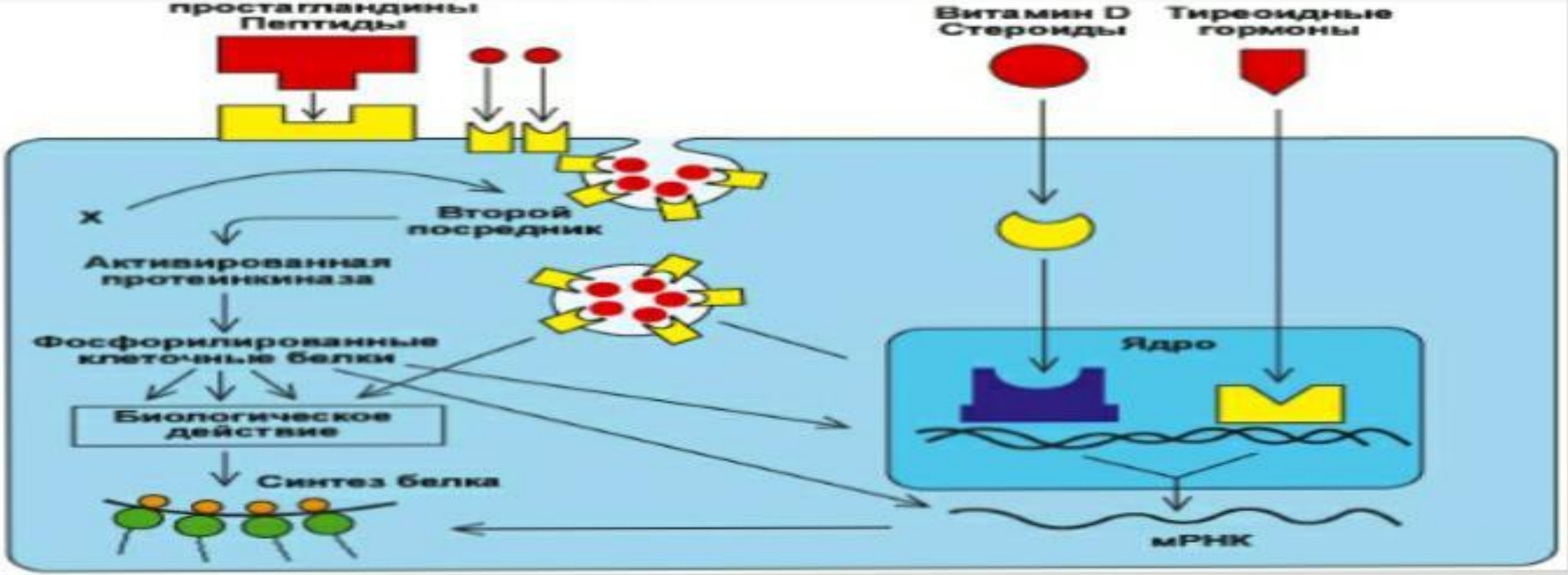
Reach the target organs

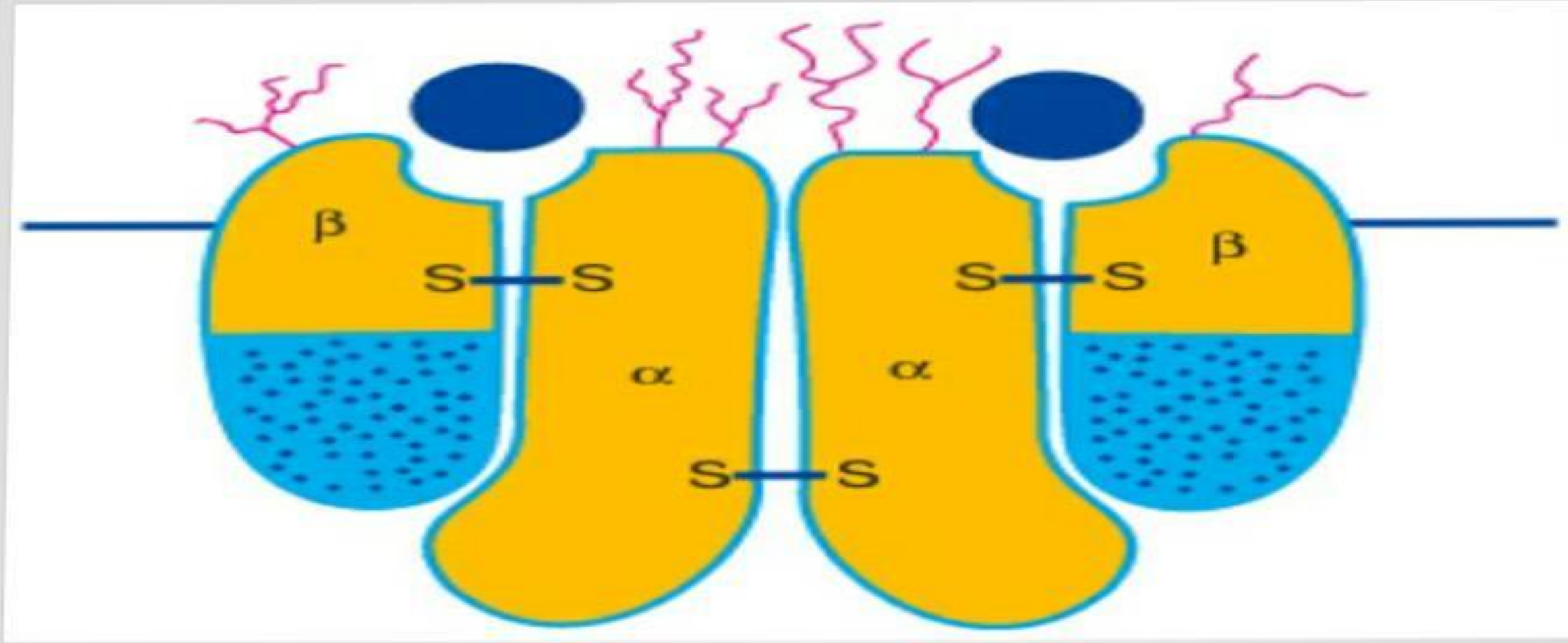
Cells have the specific receptors to certain hormone

Receptors of hormones

Two groups:

- Placed on the surface of membrane – peptide and protein hormones, prostaglandins;
- Placed inside the cells (cytoplasm, nucleus) – steroid and thyroid hormones





Model of the insulin receptor
(Jacobs, Cautrecasas, 1982)

Inactivation of hormones

After biochemical effect hormones are released and metabolized

Hormones are inactivated mainly in liver

Inactive metabolites are excreted mainly with urine

Half-time life

- from several min to 20 min – for the majority of hormones
- till 1 h – for steroid hormones
- till 1 week – for thyroid hormones

The final effects of hormones action

1. **Change the permeability of cell membrane,** accelerate the penetration of substrates, enzymes, coenzymes into the cell and out of cell.
2. **Acting on the allosteric centers affect the activity of enzymes** (hormones penetrating membranes).

3. ***Affect the activity of enzymes through the messengers (cAMP).*** (Hormones that can not penetrate the membrane).

4. ***Act on the genetic apparatus*** of the cell (nucleus, DNA) and promote the synthesis of enzymes (Steroid and thyroid hormones).

THANK YOU