

The Importance of Hormones as Bioregulators, Hormone Signalisation, Interaction with Receptors, Hormonal Effects

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Hormones

The hormone is a chemical messenger between cells (or group of cells). These are organic compounds of different chemical nature, which act in small quantities. Their action is specific, so the lack leads to significant changes in the body. All multicellular organisms produce hormones (including plants - phytohormones).

Hormone signaling

Sending hormones through this hierarchy includes the following:

1. Biosynthesis of a particular hormone in a particular tissue.
2. Hormone storage and secretion.
3. Transfer of the hormone to the target cell (cells).
4. Recognition of hormones by the associated cell membrane or intracellular receptor protein.
5. Transferring and amplifying the received hormone signal through the signal transmission process. This process then leads to a cellular reaction. The reaction of the target cell can be recognized by the original hormone by the cell which produces the hormone, leading to deregulation in the production of hormones. This is an example of a homeostatic negative feedback.
6. Hormone degradation.

Interaction with receptors

Most hormones initiate a cellular reaction based on initial combination with a specific intracellular or receptor protein linked to the cell membrane. Cells may have different receptors that recognize the same hormone and activate different signal transmission pathways, or alternatively different hormones and their receptors can use the same biochemical process.

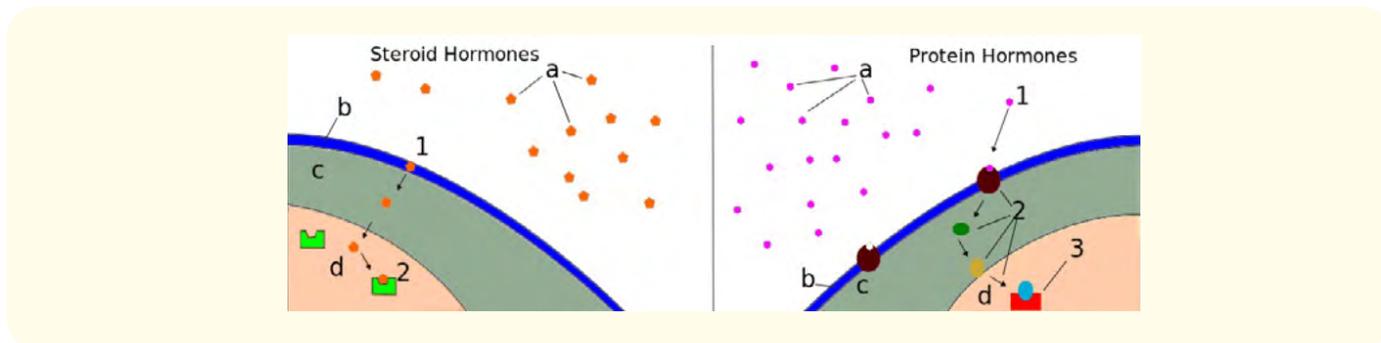
For most hormones, including most protein hormones, the receptor is linked to the membrane and embedded in the plasma membrane on the surface of the cell.

For hormones such as steroids or thyroid hormones, receptors are located intracellularly within the cytoplasm of their target cell. In order to tie their receptors, these hormones must pass through the cell membrane.

It is also important to take into account the formation of an effective concentration of hormone receptor complexes, which determines the level at which the cell signal transmission is activated in response to the hormonal signal.

The concentration of the hormone receptor complex is effectively determined on the basis of three factors:

1. The available number of hormone molecules for complex formation
2. Available number of receptor molecules for complex formation and
3. A binding affinity between hormones and receptors



In general, the number of hormonal molecules available for complex formation is a key factor in determining the level at which the signal transmission is activated. The number of receptors on the surface of the recipient cell can also be as diverse as the affinity between the hormone and its receptors.

Hormonal effects

The effects of the hormone are different but may include:

- Stimulation or inhibition of growth
- The onset or prevention of apoptosis (programmed cell death)
- Activation or inhibition of the immune system
- Regulation of metabolism
- Preparing for a new activity (for example: fighting, running, mating etc.)
- Preparing for a new stage of life (for example: puberty, care for offspring, menopause etc.)
- Controlling the reproductive cycle

In many cases, a hormone can regulate the production and release of other hormones. A large number of reactions to hormone signals can be described in the sense that they serve to regulate the metabolic activity of organs or tissues.

The importance of hormones as bioregulators

Hormones regulate and maintain the overall metabolism, blood composition and other body fluids, normal functioning of the organs, control and provide growth and development of various tissues, organs and the whole organism. There is almost no process that is not directly or indirectly under the influence of one or more of the hormones. Each hormone has specific effects on the metabolism and function of specific organs. Sex hormones affect the development of primary and secondary sexual characteristics. Cortisol affects the metabolism of carbohydrates, aldosterone to the content of electrolytes, and so on. Due to lack of, reduction in synthesis or increased production of hormones, changes in chemical reactions that disturb metabolism can result in various disorders and diseases. Scientists have discovered which steroid hormone is the oldest. It turned out to be a female sex hormone - Estrogen. It is assumed to exist over 450 million years, through many of its own modifications. Its current role in deferring sex was formed much later after its occurrence.

This discovery puts the end on an evolutionary riddle, explaining the production of new hormones and other molecules as parts of a complex biological system. Steroid hormones are crucial for a huge part of biological processes, but their evolutionary origin is a mystery. Some of them are sex hormones like Estrogen, Testosterone and Progesterone. So as and adrenal hormones Cortisol and Aldosterone, which regulate the behavior, immunity, and response of an organism to stress and external influences.

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