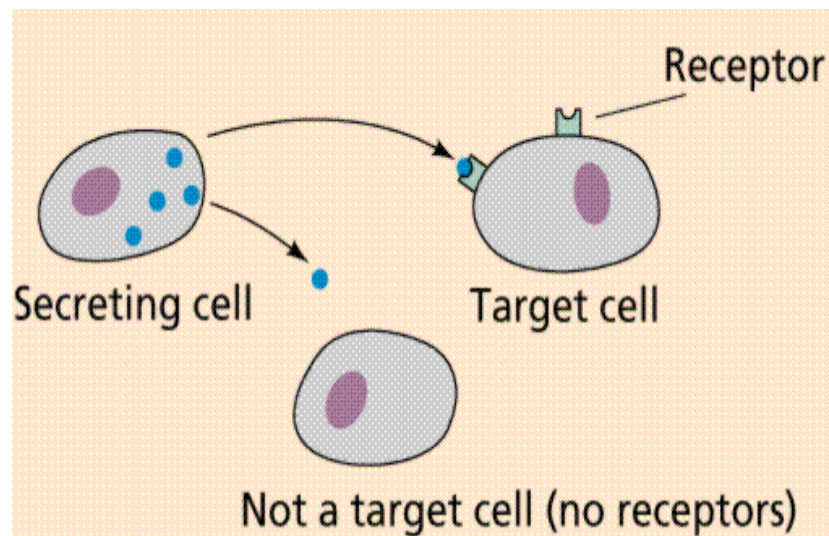


Lecture 10

Hormones

Hormones are chemical messengers that are secreted directly into the blood, which carries them to organs and tissues of the body to exert their functions. There are many types of hormones that act on different aspects of bodily functions and processes. Some of these include:

- Development and growth
- Metabolism of food items
- Sexual function and reproductive growth and health
- Cognitive function and mood



Endocrine vs. Nervous System

1) The nervous system and endocrine system interact and operate together in order to help the body achieve homeostasis. Despite both systems having the same goal to achieve a stable internal environment within the organism they exhibit differences in terms of how they operate.

2) In the nervous system the speed of the transmission is relatively fast, as the message only needs to be transmitted across minor synaptic distances. Conversely, in the endocrine system the speed of hormonal signals are generally slower. This is because the message is usually transmitted over long distances and the hormone needs to find its appropriate receptor to bind and initiate a response.

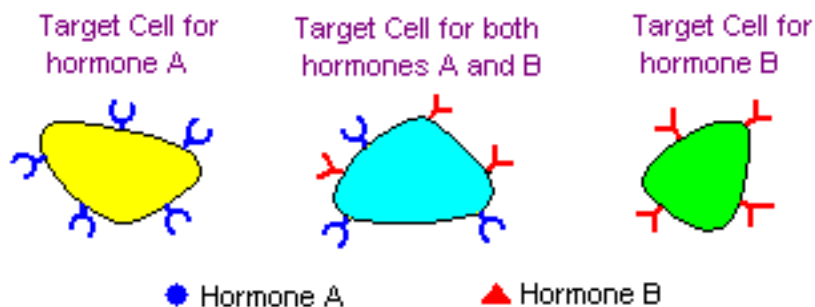
3) In the nervous system the duration of the response is relatively short. Once a neural impulse has been sent the neurotransmitter at the synapse has been inactivated relatively quickly and nothing further happens once the signal is transmitted. In contrast, in the endocrine system, hormones are typically longer sustaining responses.

Hormonal Actions

Hormones are secreted by the glands of the endocrine system and they serve to maintain homeostasis and to regulate reproduction and development. Glands of the endocrine system secrete hormones directly into the extracellular environment. The hormones then diffuse to the bloodstream via capillaries and are transported to the target cells. Hormones are molecules that generally exert effects at sites other than that from which they were produced and secreted. In the case of endocrine messages, cells must bear a *receptor* for the hormone being broadcast in order to respond.

Hormonal Mechanism

- Most hormones circulate in blood, coming into contact with essentially all cells.
- However, a given hormone usually affects only a limited number of cells, which are called target cells.
- A target cell responds to a hormone because it bears receptors for the hormone.



Principal Functions

- 1) Hormones serve as chemical messengers in the body and help maintain homeostasis.
- 2) Hormones are released into bodily fluids, like blood, which carry them to target cells.
- 3) Target cells respond to a hormone when they express a specific receptor for that hormone.
- 4) Hormones also play a role in the regulation of cell death, the immune system, reproductive development, mood swings, and hunger cravings.
- 5) Maintenance of the internal environment in the body.
- 6) Integration and regulation of growth and development.

Types of Hormones

Endocrine hormones

Endocrine hormones are to secrete hormones directly into the bloodstream. Hormones are chemical substances that affect the activity of another part of the body (target site). In essence, hormones serve as messengers, controlling and coordinating activities throughout the body.

Neurohormones

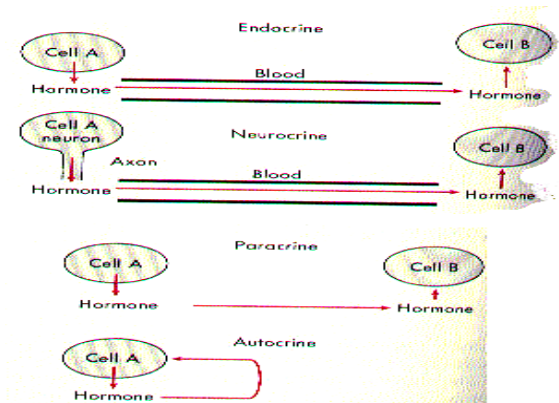
Neurohormones are any hormone produced and released by neuroendocrine cells (also called neurosecretory cells) into the blood stream. Neurohormones, they are secreted into the circulation for systemic effect, but they can also have a role of neurotransmitter or other roles such as autocrine (self) or paracrine (local) messenger.

Paracrine hormones

Paracrine hormones act on adjacent cells and autocrine. Hormones are released and act on the cell that secreted them.

Intracrine hormones

Intracrine refers to a hormone that acts inside a cell, regulating intracellular events. Steroid hormones act through intracellular (mostly nuclear) receptors and, thus, may be considered to be intracrines. In contrast, peptide or protein hormones, in general, act as endocrines, autocrines, or paracrines by binding to their receptors present on the cell surface.



Response Actions

Endocrine action

The hormone is distributed in blood and binds to distant target cells.

Paracrine action

The hormone acts locally by diffusing from its source to target cells in the neighborhood.

Autocrine action

The hormone acts on the same cell that produced.



Major Hormones and Systems

The endocrine system refers to the collection of glands of an organism that secrete hormones directly into the circulatory system to be carried towards distant target organs. The major endocrine glands include the pineal gland, pituitary gland, pancreas, ovaries, testes, thyroid gland, parathyroid gland, hypothalamus, gastrointestinal tract and adrenal glands. The endocrine system is in contrast to the exocrine system, which secretes its hormones to the outside of the body using ducts.

- Hypothalamus produces releasing factors that stimulate production of anterior pituitary hormone They act on peripheral endocrine gland to stimulate release of third hormone
- Posterior pituitary hormones are synthesized in neuronal cell bodies in the hypothalamus.
- They are released via synapses in posterior pituitary.

Example: Oxytocin and antidiuretic hormone (ADH)

References

- <http://www.news-medical.net/health/What-are-Hormones.aspx>
- <http://wiki.engageeducation.org.au/biology/unit-3/area-of-study-2-detecting-and-responding/comparison-between-the-nervous-system-and-the-endocrine-system>
- <https://www.boundless.com/physiology/textbooks/boundless-anatomy-and-physiology-textbook/endocrine-system-16/hormones-150/mechanisms-of-hormone-action-774-807/>
- <http://www.dummies.com/how-to/content/general-functions-of-hormones-in-living-creatures.html>
- <https://en.wikipedia.org/wiki/Neurohormone>
- <https://en.wikipedia.org/wiki/Intracrine>