



Clinical Endocrinology

Introduction to Endocrinology

Sawa University

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techniques

**Department of Medical
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جامعة ساوة الاهلية

كلية التقنيات الصحية والطبية

قسم تقنيات المختبرات الطبية

المرحلة الثالثة

محاضرة رقم 1

Lecture No. 1

الجانب النظري

Theoretical

.Third . Stage

تدريسي المادة : م.م عقيل محمد رسول

Definition of Hormones

- It is **a chemical substance** which is produced in **one part of the body**, **enters the circulation** and is **carried to distant** target organs and tissues to **modify their structures and functions**.
- **Hormones** are strictly speaking **stimulating substances** and **act as body catalysts**.
- The hormones **catalyze and control** diverse metabolic processes, despite their varying **actions and different specificities** **depending on the target organ**

Similarities of Hormone and Enzyme

1. They act as **body catalysts** resembling enzymes in some aspect.
2. They are required only in **small quantities**.
3. They are **not used up during the reaction**.

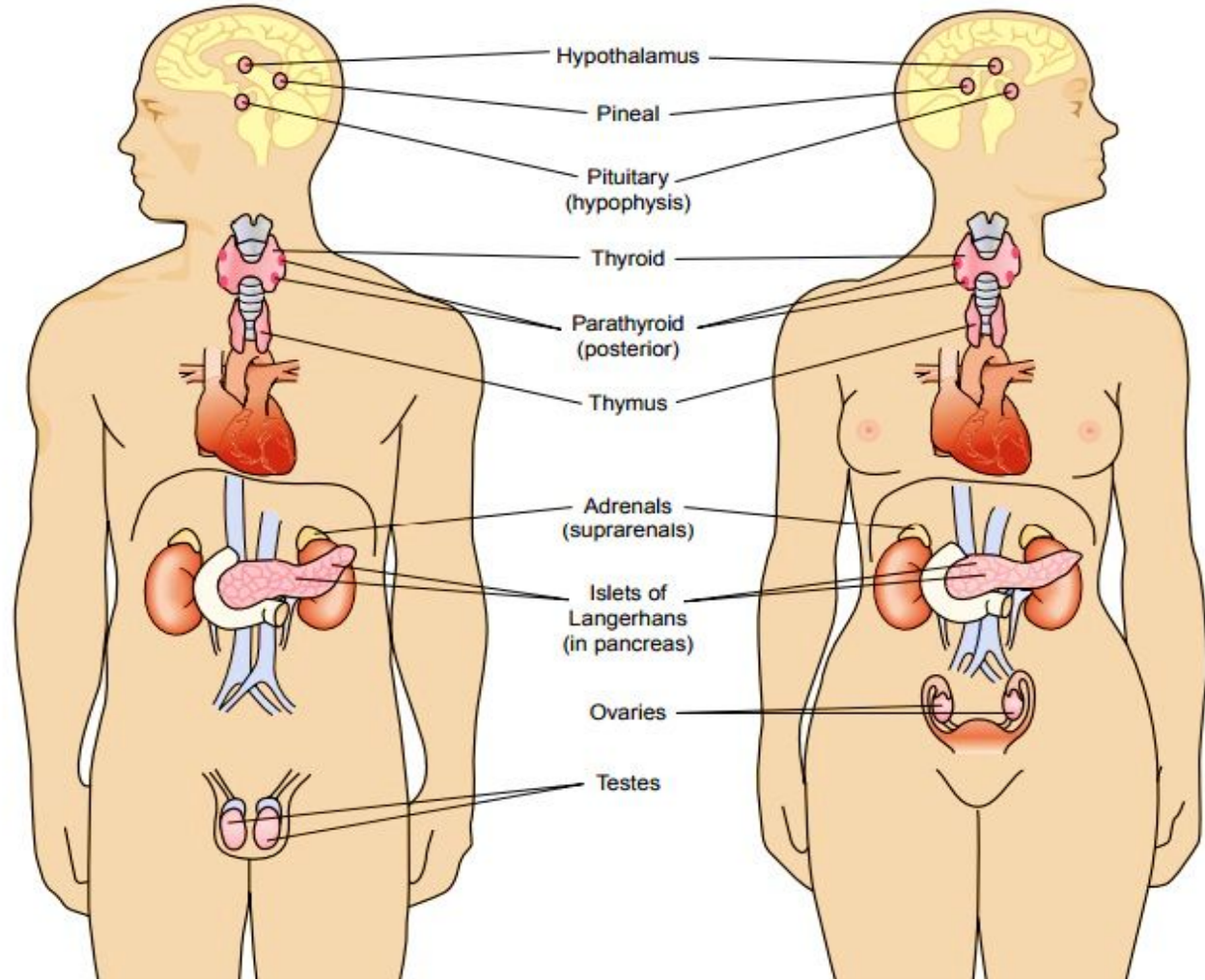
Dissimilarities of Hormone and Enzyme

They differ from enzymes in the following ways:

- 1.They are **produced in an organ other** than that in which **they ultimately perform their action**.
- 2.They are **secreted in blood** prior to use.
- 3.Thus, the circulating **levels of hormones** can **give some indication** of **endocrine gland activity** and **target organ exposure**. Because of the **small amounts of the hormones** required, **blood levels of the hormones** are **extremely low**. In many cases it is **ng/μg or mIU, etc..**
- 4.**Structurally** they are **not always proteins**. Few hormones are **protein in nature**, few are **small peptides**. Some hormones are **derived from amino acids** while some.

The major hormone secreting glands are:

- a) • Pituitary
- b) • Thyroid
- c) • Parathyroid
- d) • Adrenal
- e) • Pancreas
- f) • Ovaries
- g) • Testes



**Endocrine System:
Anatomic and
Physiologic
Overview**

Several other glandular tissues are considered to secrete hormones, viz.:

1. **Juxtaglomerular (JG) cells of kidney**: May produce the hormone erythropoietin which regulates erythrocyte maturation, erythropoiesis.
2. **Thymus**: This produces a hormone that circulates from this organ to stem cells in lymphoid organ inducing them to become immunologically competent lymphocytes.
3. **Pineal gland**: It produces a hormone that antagonises يعاكس the secretion or effects of ACTH. It also produces facto **Adrenocorticotrophic hormone (ACTH)** regulates the adrenal secretion of aldosterone.
4. **GI tract**: Few hormones are also produced by certain **Specialised cells of GI tract** and they are called **GI Hormones**

Factors Regulating Hormone Action

Action of a hormone at a target organ is regulated by four factors:

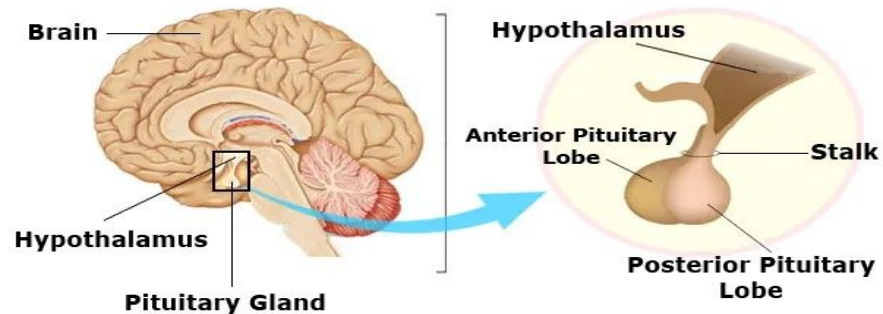
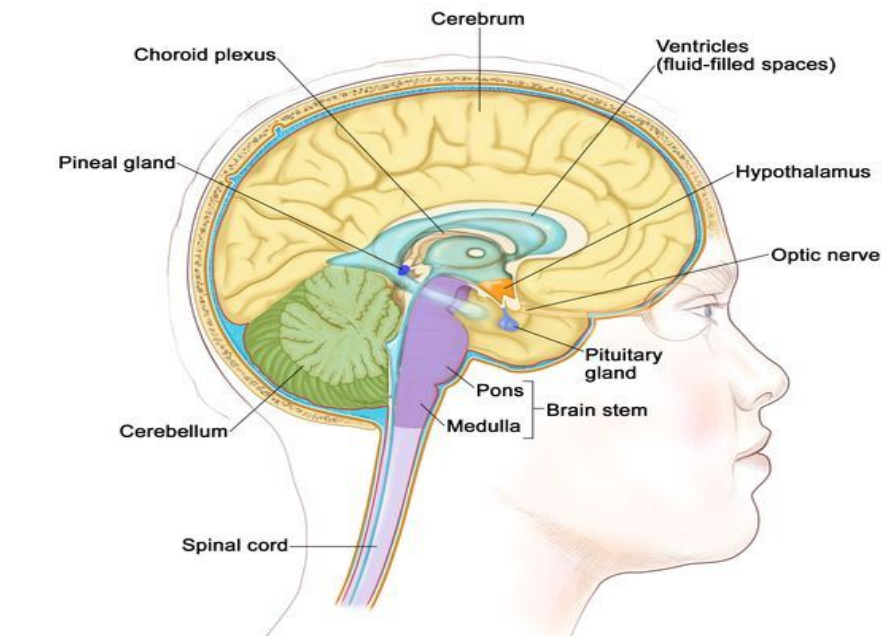
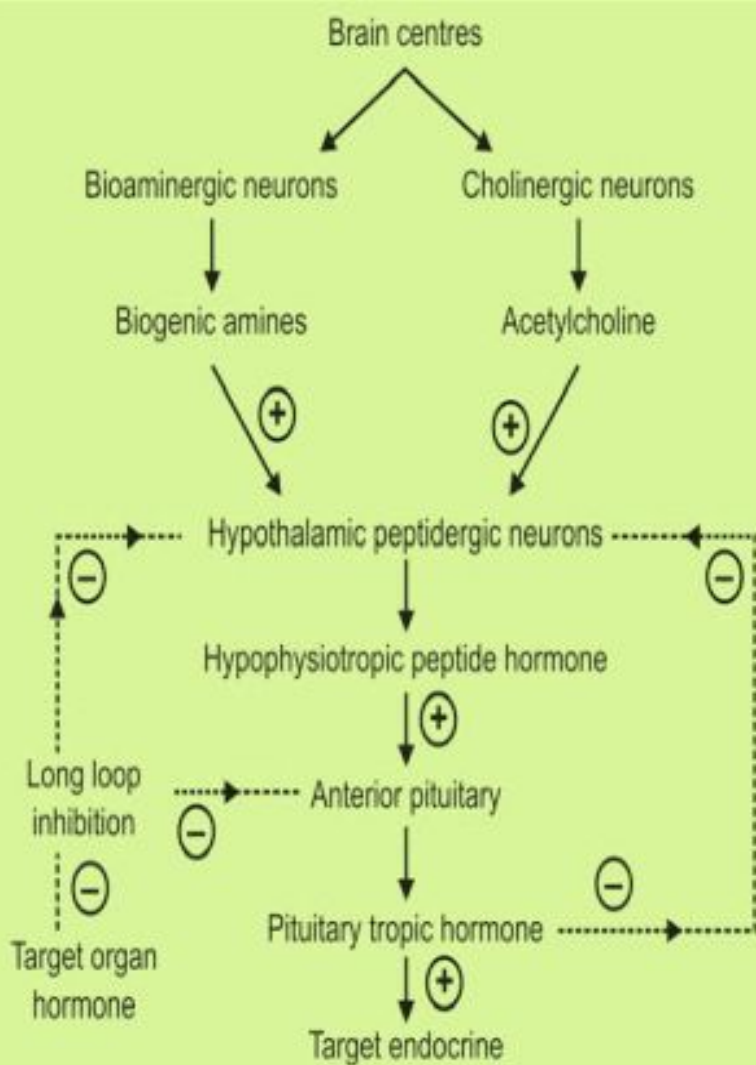
1. **Rate of synthesis and secretion**: The hormone is **stored** in the endocrine gland.
2. In some cases, specific transport systems in plasma.
3. **Hormone-specific receptors** in **target cell membranes** which **differ** from tissue to tissue, and
4. **Ultimate degradation** of the hormone usually by the liver or kidneys.

Regulation Of Hormone Secretion

Hormone secretion is strictly under control of several mechanisms.

A. Neuroendocrinal control mechanism:

- Nerve impulses control some endocrine secretions. **Cholinergic sympathetic fibres stimulate catecholamine secretion from adrenal medulla.**
- Centers in the **midbrain, brainstem, hippocampus, etc.** can send nerve impulses which react with the hypothalamus **through cholinergic and bioaminergic neurons**.
- At the **terminations of these neurons**, they **release acetylcholine and biogenic amines** to **regulate** the secretions of **hypophysiotropic peptide hormones** from **hypothalamic peptidergic neurons**.
- **Some of the endocrine releases** are **controlled by** either stimulatory or inhibitory hormones from a controlling gland, **e.g.**
 - corticosteroids are **controlled by corticotropin**
 - thyroid hormones are **controlled by thyrotropin** from **anterior pituitary**.



B. Feedback control mechanism:

It is due **mainly to negative feedback** that such control is brought about. When there is a high blood level of a target gland hormones, it may **inhibit** the secretion of the tropic hormone **stimulating** that gland.

Adrenal cortex secretes a hormone called **cortisol** which bring about the **inhibition of secretion of corticotropin** from **anterior pituitary** and **corticotropin releasing hormone** from the **hypothalamus** by long-loop feedback. This leads to **reduction in cortisol secretion**.

C. Endocrine rhythms: There are certain cyclic rhythms associated with the secretion of hormones over a period of time.

- When there is a **cyclic periodicity of 24 hours**, it is called as **circadian rhythm**.
- However, if it is **more than 24 hours**, it is named as **infradian rhythm**
- and when it is **less than 24 hours** it is called as **ultradian rhythm**.

Due to such rhythms, the highest and lowest conc. of corticotropin is normally found in **the morning and around midnight**.

- **Growth hormone and prolactin** rise in the early hours of deep sleep.
- **Cortisol peak** is found between **4 AM and 8 AM**.

Endocrine rhythms result from cyclic activities of a biological clock in **the limbic system**, *supplemented by the diurnal light-dark and sleep activity cycles and mediated by the hypothalamus*

Interactive Question
Discussion Question:

Q/If a patient has a consistently high level of a thyroid hormone, what would you expect to happen to the levels of TSH (the pituitary hormone that stimulates the thyroid) and why?"

: References Books:

- Greenspan's Basic & Clinical Endocrinology.
- Williams Textbook of Endocrinology.
- Online Resources:
- Endocrine Society: www.endocrine.org
- National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK).