

Chapter 34

Introduction to the Endocrine System

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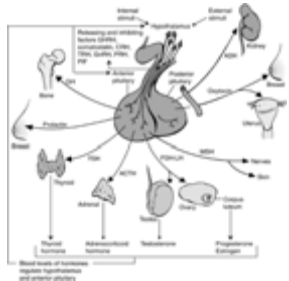
Complementary Actions of the Nervous System and Endocrine System

- They work together to maintain internal homeostasis
- They integrate the body's response to the external environment

Characteristics of All Hormones

- Produced in very small amounts
- Secreted directly into the bloodstream
- Travel through the blood to specific receptor sites
- Act to increase or decrease the normal metabolic processes of cells when they react with receptor sites
- Are immediately broken down

Endocrine System



Where Hormones Are Produced

- Pituitary gland
- Ovaries
- Testes
- Adrenal gland
- Thyroid gland
- Parathyroid gland
- Pancreas

Hormone Actions in the Body

- Hormones work in 2 different ways in the body:
 - React with a specific receptor site on a cell membrane and cause the activation of cAMP that leads to a change in cell activity. They analyze input from the periphery and the CNS. This type of hormone causes a fast reaction, such as insulin reacting with an insulin receptor site.
 - Enter the cell, react with messenger RNA, and enter the nucleus, causing a change in cell function. This takes time to cause effects. Estrogen and testosterone work this way, which accounts for the years required to cause all of the changes associated with puberty.

Hypothalamus

- Definition
 - "Master gland" of the neuroendocrine system
- Action
 - Constantly monitors the body's homeostasis by:
 - Analyzing input from the periphery and the CNS
 - Coordinating responses through the autonomic, endocrine, and nervous systems

Releasing Hormones Produced and Secreted by the Hypothalamus

- Growth hormone-releasing hormone (GHRH)
- Thyrotropin-releasing hormone (TRH)
- Gonadotropin-releasing hormone (GnRH)
- Corticotropin-releasing hormone (CRH)
- Prolactin-releasing hormone (PRH)

Inhibiting Factors Produced by the Hypothalamus

- Growth hormone release-inhibiting factor (somatostatin)
- Prolactin-inhibiting factor (PIF)

Two Other Hormones Produced by the Hypothalamus

- Antidiuretic hormone (ADH)
- Oxytocin
 - Stored in the posterior pituitary to be released when stimulated by the hypothalamus

Networks Connecting the Hypothalamus to the Pituitary Gland

- A vascular network carries the hypothalamic-releasing factors directly into the anterior pituitary
- A neurological network delivers ADH and oxytocin to the posterior pituitary to be stored

Lobes of the Pituitary Gland

- Anterior lobe
 - Produces 6 major anterior pituitary hormones
- Posterior lobe
 - Stores 2 hormones
- Intermediate lobe
 - Produces endorphins and enkephalins

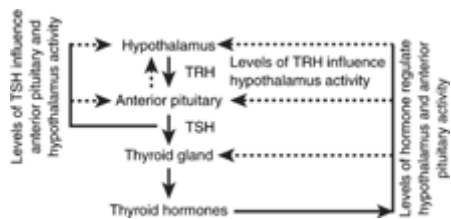
Major Anterior Pituitary Hormones

- Growth hormone (GH)
- Adrenocorticotropic hormone (ACTH)
- Follicle-stimulating hormone (FSH)
- Luteinizing hormone (LH)
- Prolactin (PRL)
- Thyroid-stimulating hormone (TSH, also called thyrotropin)

Anterior Pituitary Hormones That Do Not Have a Target Organ

- Growth hormone and prolactin
 - They cannot be regulated by the same type of feedback mechanism
 - Their release is directly inhibited by the hypothalamic-inhibiting factors somatostatin and PIF

Negative Feedback System



Negative Feedback System (cont.)

- Hypothalamus senses a need for a particular hormone
- It secretes the releasing factor directly into the anterior pituitary
- In response, the anterior pituitary secretes the hormone
- The hormone in turn stimulates the gland
- The hypothalamus senses increases for a particular hormone and sends a message to the anterior pituitary to stop production

Other Hormones Released in Response to Stimuli

- Insulin, glucagon, and somatostatin
- Parathormone
- Erythropoietin and renin
- GI hormones
- Calcitonin
- Prostaglandins
- ACTH and the adrenocorticoid hormones
- Aldosterone

Hypothalamic—Pituitary Axis (HPA)

- The hypothalamus secretes releasing factors to cause the anterior pituitary to release stimulating hormones
- These hormones act with specific endocrine glands to cause the release of hormones or stimulate cells directly
- This stimulation shuts down the production of releasing factors
- This leads to decreased stimulating factors and decreased hormone release
