

# 10 The Endocrine System

## *Chapter Summary*

The endocrine system works together with the nervous system to coordinate body functions and maintain homeostasis. Endocrine glands release chemicals called hormones into the bloodstream. These hormones affect the functioning of target organs at other locations in the body. The activity of many endocrine glands is regulated by a negative feedback mechanism in which a gland's own hormone or the condition that a gland is regulating can cause a gland to cease hormone secretion. The hormones produced by the hypothalamus, pituitary, thyroid, parathyroid, adrenal glands, pancreas, testes, ovaries, thymus, and pineal gland are listed and the effects of these hormones are discussed. Conditions associated with abnormal levels of hormone secretion are also discussed as are the effects of several hormones that are not associated with glands. Several of these hormones are growth factors and others are locally acting hormones called prostaglandins. The importance of chemical signaling is explained and the signaling mechanisms of the two basic classes of hormones are described. Peptide hormones bind to specific receptors in cell membranes, thereby activating cAMP molecules which, in turn, activate enzymes involved in various cell activities. Steroid hormones pass through cell membranes and bind to receptors in the cytoplasm. The resulting complex moves into the nucleus and activates specific genes.

## *Chapter Outline*

- I. Endocrine Glands
  - A. Hormones and Homeostasis
- II. Hypothalamus and the Pituitary Gland
  - A. Posterior Pituitary
    - 1. Antidiuretic Hormone (ADH)
    - 2. Oxytocin
  - B. Anterior Pituitary
    - 1. Thyroid Stimulating Hormone (TSH)
    - 2. Adrenocorticotrophic Hormones (ACTH)
    - 3. Gonadotropic Hormones
    - 4. Prolactin (PRL)
    - 5. Growth Hormone (GH)
      - a. Effects of Growth Hormone
- III. Thyroid and Parathyroid Glands
  - A. Thyroid Gland
    - 1. Effects of Thyroid Hormones
    - 2. Calcitonin
  - B. Parathyroid Glands
- IV. Adrenal Glands
  - A. Glucocorticoids (e.g. Cortisol)
  - B. Mineralocorticoids (e.g. Aldosterone)
  - C. Malfunction of the Adrenal Cortex
    - 1. Addison Disease and Cushing Syndrome
- V. Pancreas
  - A. Diabetes Mellitus

- VI. Other Endocrine Glands
  - A. Testes and Ovaries
    - 1. Androgens
    - 2. Estrogen and Progesterone
  - B. Thymus
  - C. Pineal Gland
  - D. Hormones from other tissues
    - 1. Leptin
    - 2. Growth Factors
    - 3. Prostaglandins
- VII. Chemical Signals
  - A. How Hormones Function
  - B. Importance of Chemical Signals
    - 1. Chemical Signals Between Individuals
- VIII. Effects of Aging
- IX. Homeostasis

*Suggested Student Activities*

1. Study the effect of the hormones from the adrenal cortex on the level of glucose in the blood.
2. Study the effect of too little ADH being produced and how it affects the kidneys.
3. Explain how the body maintains normal levels of calcium in the blood.
4. Discuss the possible adverse reactions to the taking of anabolic steroids.

*Answers to Objective Questions*

- |                            |                         |   |
|----------------------------|-------------------------|---|
| 1. negative feedback       | 6. calcium              | 11. steroid, peptide                              |
| 2. produces, ADH, oxytocin | 7. cortex               | 12. medulla, cortex, adrenocorticotrophic hormone |
| 3. hormones                | 8. Cushing syndrome     |   |
| 4. anterior                | 9. pancreas, body cells |   |
| 5. too little, thyroxine   | 10. blood               |   |

*Answers to Medical Terminology Reinforcement Exercise*

1. anti/di/uret/ic - against flow-through of urine (agent that suppresses urine formation)
2. hypophys/ectomy - surgical excision of the pituitary gland
3. gonado/tropic - stimulating the gonads (sex glands)
4. hypo/kal/emia - low potassium level in the blood
5. lacto/gen/ic - producing milk (stimulating the production of milk)
6. adreno/pathy - disease of adrenal (next to kidney) gland
7. adeno/malacia - abnormal softening of a gland
8. parathyroid/ectomy - surgical excision of parathyroid (alongside thyroid) gland
9. poly/dipsia - excessive, prolonged thirst
10. dys/pituitarism - abnormally functioning pituitary gland
11. keto/acid/osis - abnormal acidic blood pH with ketone accumulation
12. thyroid/itis - inflammation of the thyroid
13. glucos/uria - glucose in the urine
14. micro/somia - condition of having an abnormally small body
15. andro/genic alopec/ia - androgen (testosterone) induced hair loss

*Audiovisual Materials*

1. Filmstrip - The Endocrine System (Career Aids)
2. Model - Endocrine System (Concept Media)
3. Charts, Posters, and Transparencies (Concept Media)