The Endocrine System

OBJECTIVES

After studying this chapter, you should be able to:

1. List the functions of hormones.
2. Classify hormones into their major chemical categories.
3. Describe how the hypothalamus of the brain controls the endocrine system.
4. Name the endocrine glands and state where they are located.
5. List the major hormones and their effects on the body.
6. Discuss some of the major diseases of the endocrine system and their causes.

ACTIVITIES

A. Completion

Fill in the blank spaces with the correct term.

1. The hypothalamus sends directions to the pituitary gland by __ __.
2. Endocrine glands are ductless glands. This means they secrete their hormones directly into the __.
3. Negative feedback means that when a hormone reaches a certain level, the gland’s secretion is __.
4. Hormones can be classified into __ categories.
5. The simplest group of hormones is the modified __ __.
6. The second category of hormones is the __ __ hormones.
7. __ __ are the third kind of hormones.
8. Steroid hormones are soluble in __.
9. Because they cannot diffuse across the intestinal lining, protein and modified amino acid hormones like insulin must be __.
10. Anabolic steroids are variants of __.
11. Athletes use anabolic steroids to build __ __.

NAME: _______________________________ DATE: ________________

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12. The chemical signals of the hypothalamus are called ___ ___ and ___ - ___ .
13. The pituitary gland is also called the ___ .
14. The pituitary gland has two lobes, the ___ and the ___ lobes.
15. The larger of the lobes produces ___ hormones.
16. TSH stimulates the ___ gland to produce its hormone.
17. MSH increases the production of melanin and this ___ the skin.
18. Luteinizing hormone stimulates ___ in the female.
19. ADH inhibits the body from excreting ___ .
20. Oxytocin stimulates contraction of the uterus and also stimulates ___ .
21. A goiter is an enlarged ___ gland.
22. To properly function, the thyroid gland must have ___ .
23. The parathyroid glands consist of ___ cells and ___ cells.
24. The hormone from the parathyroid glands functions to balance ___ levels in the body.
25. The adrenal medulla secretes ___ ; the adrenal cortex secretes a number of hormones, the most important of which is ___ .
26. The middle layer of the adrenal cortex secretes ___ , which is also known as ___ .
27. The sex hormones secreted by the inner layer of the adrenal cortex are ___ .
28. The islets of Langerhans are located on the ___ , and they produce the hormones ___ and ___ .
29. Glycosuria is a condition of elevated sugar in the ___ .
30. The thymus gland is important in the development of ___ .
31. ___ syndrome is caused by a long-term excessive production of cortisol.
32. Adrenogenital syndrome occurs due to excessive secretion of androgens from the ___ ___ .
33. ___ affective disorder produces a type of depression.

B. Matching

Match the term on the right with the definition on the left.

___ 34. secretes into blood a. adrenals
___ 35. have ducts b. thyroxine
___ 36. simplest hormones c. pituitary gland
___ 37. stimulates or inhibits hormone release d. cortisol
___ 38. controls many glands e. oxytocin
___ 39. stimulates cell metabolism f. parathormone
___ 40. darkens the skin g. prolactin
___ 41. maintains progesterone during pregnancy h. Graves disease
___ 42. maintains water balance i. vitamin D
___ 43. ADH deficiency j. MSH
___ 44. stimulates lactation k. modified amino acids
___ 45. enlarged thyroid l. glucagon
___ 46. contains four iodine atoms m. calcitonin

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C. Key Terms
Use the text to look up the following terms. Write the definition or explanation.

54. Acidosis:

55. Addison's disease:

56. Adrenal glands/suprarenal glands:

57. Adrenocorticotropic hormone/ACTH:

58. Alpha cells:

59. Androgens:

60. Antidiuretic hormone/ADH/vasopressin:

61. Beta cells:
62. Chief cells:

63. Cretinism:

64. Cushing’s syndrome:

65. Diabetes insipidus:

66. Diabetes mellitus:

67. Estrogen:

68. Exophthalmia:

69. Graves disease:

70. Growth hormone:

71. Homeostasis:

72. Hyperglycemia:
73. Hypophysis:

74. Melatonin:

75. Myxedema:

76. Negative feedback system:

77. Oxyphil cells:

78. Pineal gland/body:

79. Polydipsia:

80. Polyphagia:

81. Polyuria:

82. Releasing hormones:
83. Releasing-inhibitory hormones:

84. Thymosin:

85. Thyroxine or tetraiodothyronine (T₄):

86. Triiodothyronine (T₃):

D. Labeling Exercise

87. Label the parathyroid glands and their cellular components as indicated in Figure 12-1.

![Figure 12-1](image-url)
88. Label the endocrine glands as indicated in Figure 12-2.

Figure 12-2

A. __________________________  F. __________________________
B. __________________________  G. __________________________
C. __________________________  H. __________________________
D. __________________________  I. __________________________
E. __________________________  J. __________________________
E. Coloring Exercise

89. Using Figure 12-3, color the corpus callosum red, the thalamus blue, the pineal gland green, the pituitary gland yellow, and the hypothalamus brown.

Figure 12-3

F. Critical Thinking

Answer the following questions in complete sentences.

90. Why must hormones like insulin and oxytocin be injected?

91. Explain some of the dangers associated with overuse of anabolic steroids.

92. Why does excess secretion of growth hormone in childhood produce gigantism and in adulthood acromegaly?
93. Why are goiters much less common today than 100 years ago?

94. Explain the difference between the effects of hypothyroidism in adults and in children.

95. Explain the effects of hypoparathyroidism.

96. Differentiate between diabetes mellitus type 1 and type 2.

97. Identify age-related changes to the endocrine system and one effective strategy for offsetting these changes.

98. Evaluate your interest and abilities for one of these career paths: nuclear medicine technologist, endocrinologist, or diabetes dietician.
G. Crossword Puzzle

Complete the crossword puzzle using the following clues.

ACROSS

4. Stimulates uterine contraction  
7. Hormone producing T lymphocytes  
9. Pineal gland hormone  
11. Secreted from the adrenal cortex  
14. Enlarged hands and feet  
16. Male sex hormone  
20. Secreted by the thyroid gland  
21. Adrenal sex hormones  
24. Route for hormone transport  
25. Bones become soft  
26. Ductless glands  
27. Stimulated by luteinizing hormone  
28. Master gland of endocrine system  
29. Pituitary gland

DOWN

1. Female sex hormone  
2. Control the body's internal environment  
3. Low blood pH  
5. Stimulates milk production  
6. Secreted by pancreatic islets  
8. Inferior diencephalon  
10. Fight-or-flight hormone  
12. Adult hypothyroidism condition  
13. Children's hypothyroidism  
15. Regulates sodium reabsorption  
17. Bulging eyes  
18. Antidiuretic hormone  
19. Intense food craving  
22. Excess sugar in urine  
23. Acts as vasoconstrictor
CASE STUDY

Isabella, a 48-year-old woman, is seeing a health care provider at her HMO. The care provider notes that Isabella's eyes are protruding, and her hands have a slight tremor. Isabella states that she has been feeling nervous, anxious, and extremely exhausted. She has also been experiencing heart palpitations. In addition, she says that she lost 10 pounds over the last two weeks without dieting. The care provider examines Isabella's neck and finds that her thyroid gland is enlarged. Based on these findings, the care provider refers Isabella to a specialist for further evaluation.

QUESTIONS

1. What endocrine disorder might Isabella have?

2. Elevations of which hormones are responsible for causing this disorder?

3. What type of medical specialist should Isabella see for further evaluation?

4. How is this condition treated?

CHAPTER QUIZ

1. The gland crucial to the immune system is the
   - a. pituitary
   - b. thymus
   - c. thyroid
   - d. adrenal
   - e. pineal

   **Answer:**

2. The gland responsible for the secretion of melatonin is the
   - a. pituitary
   - b. thymus
   - c. thyroid
   - d. adrenal
   - e. pineal

   **Answer:**

3. The gland that secretes cortisol is the
   - a. pituitary
   - b. thymus
   - c. thyroid
   - d. adrenal
   - e. pineal

   **Answer:**

4. The secretion that regulates the blood sugar level is
   - a. cortisol
   - b. thyroxin
   - c. glucagon
   - d. melatonin
   - e. none of the above

   **Answer:**
5. A low blood sugar level can cause
   a. acidosis
   b. pancreatitis
   c. hypothyroidism
   d. goiter
   e. none of the above

Answer:

6. Epinephrine is secreted by the
   a. pituitary
   b. thyroid
   c. thymus
   d. pancreas
   e. none of the above

Answer:

7. Vitamin D increases the absorption of
   a. sodium
   b. calcium
   c. chlorine
   d. potassium
   e. none of the above

Answer:

8. Which of the following glands needs iodine to function correctly?
   a. thymus
   b. pituitary
   c. thyroid
   d. adrenal
   e. none of the above

Answer:

9. ADH helps maintain proper water balance in the body. It is also called
   a. vasopressin
   b. adrenaline
   c. thymosin
   d. oxytocin
   e. none of the above

Answer:

10. The hormone that stimulates ovary follicle development and sperm cell production is
    a. FSH
    b. MSH
    c. LH
    d. TSH
    e. none of the above

Answer:

11. The master gland is controlled by the
    a. pituitary
    b. thalamus
    c. hypothalamus
    d. cerebellum
    e. none of the above

Answer:

12. The hormones that can diffuse across cell membranes are the
    a. proteins
    b. steroids
    c. amino acids
    d. oxytocin
    e. none of the above

Answer:
13. Which of the following is NOT a function of hormones?
   a. growth  
   b. reproduction  
   c. behavior patterns  
   d. maturation  
   e. metabolism  

   **Answer:**

14. Which of the following organs controls water levels and electrolyte balance?
   a. pancreas  
   b. liver  
   c. kidneys  
   d. heart  
   e. none of the above  

   **Answer:**

15. The production of T lymphocytes is done in the
   a. thyroid  
   b. pituitary  
   c. parathyroid  
   d. thymus  
   e. none of the above  

   **Answer:**

16. Glycogen is stored for use between meals. It is stored in which organ?
   a. pancreas  
   b. liver  
   c. kidneys  
   d. heart  
   e. none of the above  

   **Answer:**

17. The functions of the reproductive system are inhibited by
   a. thymosin  
   b. melatonin  
   c. renin  
   d. thyroxine  
   e. none of the above  

   **Answer:**

18. The pineal gland secretes which two substances?
   a. melatonin/serotonin  
   b. thyroxine/thymosin  
   c. estrogen/progesterone  
   d. ADH/oxytocin  
   e. none of the above  

   **Answer:**

19. Polyuria, polydipsia, and polyphagia are associated with
   a. gigantism  
   b. cretinism  
   c. acromegaly  
   d. diabetes  
   e. none of the above  

   **Answer:**

20. If blood glucose decreases excessively, fatty acids and what are released to cause acidosis?
   a. proteins  
   b. sugar  
   c. ketones  
   d. steroids  
   e. none of the above  

   **Answer:**
21. Pancreatic juice is produced by
   - a. acini cells
   - b. alpha cells
   - c. beta cells
   - d. red cells
   - e. none of the above

   **Answer:**

22. Insulin is produced by
   - a. acini cells
   - b. alpha cells
   - c. beta cells
   - d. red cells
   - e. none of the above

   **Answer:**

23. Glucagon is produced by the
   - a. acini cells
   - b. alpha cells
   - c. beta cells
   - d. red cells
   - e. none of the above

   **Answer:**

24. Androgens are produced by the
   - a. acini cells
   - b. alpha cells
   - c. beta cells
   - d. red cells
   - e. none of the above

   **Answer:**

25. Overproduction of hormones by the adrenal cortex can lead to
   - a. Addison's disease
   - b. Graves disease
   - c. Cushing's syndrome
   - d. cretinism
   - e. none of the above

   **Answer:**

26. A bronzing of the skin is a symptom of which disease?
   - a. Addison's disease
   - b. Graves disease
   - c. Cushing's syndrome
   - d. cretinism
   - e. none of the above

   **Answer:**

27. The gland sitting atop the kidney is the
   - a. pituitary
   - b. adrenal
   - c. thymus
   - d. thyroid
   - e. none of the above

   **Answer:**

28. Which of the following hormones is secreted by the thyroid gland?
   - a. serotonin
   - b. oxytocin
   - c. calcitonin
   - d. cortisol
   - e. melatonin

   **Answer:**
29. Which of the following is a disease of the thyroid gland?
   a. Cushing's syndrome
d. goiter
   b. acromegaly
e. none of the above
   c. Addison's disease

Answer:

30. Which of the following stimulates milk production?
   a. FSH
d. LH
   b. LTH
e. none of the above
   c. MSH

Answer:

31. Which hormone stimulates the thyroid gland to produce its own hormone?
   a. TSH
d. LH
   b. FSH
e. calcitonin
   c. MSH

Answer:

32. What makes up the bulk of the adrenal gland?
   a. adrenal medulla
d. skeletal muscle
   b. adrenal cortex
e. kidney
   c. Bowman's capsule

Answer:

33. Thymosin causes the production of which of the following?
   a. white blood cells
d. platelets
   b. FSH
e. none of the above
   c. thyroid hormone

Answer: